EVIDENCE-BASED CLINICAL GUIDELINES

FOR THE MANAGEMENT OF

ACUTE LOW BACK PAIN

Prepared by

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on behalf of

THE AUSTRALASIAN FACULTY OF MUSCULOSKELETAL MEDICINE

for

THE NATIONAL MUSCULOSKELETAL MEDICINE INTIATIVE

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Chapter 1. Introduction

In order to introduce the following Guidelines for the Evidence-Based Management of Acute Low Back Pain, this chapter addresses several seminal issues: why the need for guidelines, how they were prepared, by whom, and what they entail.

Why

Back pain is a common health problem in Australia. Data from the Australian Bureau of Statistics [1] indicate that, in 1989-1990, 607,800 individuals presented with back pain as a recent illness. This incidence was exceeded only by that of headache, arthritis, asthma, the common cold and dermatitis. As a cause of long-term illness, back disorders affected 1,921,400 individuals: more than the number affected by hay fever, asthma, hypertension, and dermatitis, as the leading causes of long-term illness; and exceeded only by the number of people who wore glasses.

In 1995[2], back problems were experienced as a recent illness by 635,700 people, exceeded again only by the number of people with headache, arthritis, hypertension, asthma and the common cold. By way of reference, other health problems were experienced by fewer than 561,500 people. Back problems accounted for 895,200 people with chronic illness, exceeded only by disorders of refraction, arthritis, hay fever, asthma, hypertension, sinusitis, deafness, allergy and varicose veins. Other, individual major medical problems affected fewer than 495,100 people.

That a condition is common is not reason alone to justify the production of guidelines for management. Guidelines are not required if the condition is already adequately managed.

There are no explicit data on how well back pain is managed in Australia. Those with concerns, such as insurers and workers compensation authorities, and even the Department of Health and Community Services, usually do not publish data and their views. The Grellman report [3] from the WorkCover Authority of NSW reported concerns about the growing cost of workers' compensation in New South Wales, and back problems were a major component of burden of illness covered by this report.

Local concerns seem to be driven, or echo, international concerns. Perceiving that there is, indeed, a problem in the way that back pain is managed, several countries have prepared guidelines in recent years. The leading reports are the AHCPR guidelines [4], the UK guidelines [5], and the Dutch guidelines [6]. Those of New Zealand [7], are a reproduction of the UK guidelines [5].

Based on the experience of its members, the Australasian Faculty of Musculoskeletal Medicine, and its founding associations: the Australian Association of Musculoskeletal Medicine and the New Zealand Association of Musculoskeletal Medicine, believed that back pain was, indeed, poorly managed, both in Australia and in New Zealand. Accordingly, the Faculty believed that guidelines were required. Moreover, because it believed that overseas guidelines were inappropriate, inadequate, incomplete or out-of-date, the Faculty felt that an Australian product was justified. Even if it were to prove not true, that back pain was poorly managed in Australia, the Faculty felt that there was nevertheless merit in harvesting and providing for Australian medical practitioners and other interested parties a synopsis of what would constitute evidence-based, best practice for this condition.

How

The Guidelines for Acute Low Back Pain were prepared under the auspices of the National Musculoskeletal Medicine Initiative: a program developed by the Australasian Faculty of Musculoskeletal

Medicine at the invitation of the Federal Minister for Health - Dr Michael Wooldridge. The Initiative was commissioned:

1. to develop the evidence-base for medical management of acute musculoskeletal pain problems;

2. to evaluate the efficacy, safety, and cost-effectiveness of evidence-based care for these problems; and

3. to determine by audit how these problems are currently managed in general practice.

Back pain is but one of the musculoskeletal problems addressed by the Initiative. Others include, neck pain, shoulder pain, pain in the elbow, pain in the wrist, thoracic spinal pain, hip pain, knee pain, and pain in the ankle and foot. The guidelines for the management of acute low back pain were the first to be produced, and are the first to be submitted for public review.

In preparing the Guidelines for Acute Low Back Pain, the Faculty, for the greater part, followed the guidelines for guidelines issued by the NH&MRC, first the first edition [8], and subsequently the second edition [9] of those guidelines. The cardinal exception is that the Guidelines were not prepared by a multidisciplinary panel (see below).

In accordance with the rating scale of Ward and Grieco [10], the present guidelines

- address acute low back pain;
- suffered by adults (they expressly avoid the issue of back pain in children);
- define proposed interventions;
- have reduced pain and disability, and improved safety and cost-effectiveness as health outcomes;
- used an extensive literature search to identify evidence;
- provide evidence synthesised into prose-form, according to NH&MRC guidelines;
- provide references to all information gathered;
- were subjected to review;
- identify exceptions where known and where appropriate;
- are unambiguous to those who have read them to date;
- use clear headings, lists and flow charts;
- list the participants who participated in their development.

Certain of the criteria of Ward and Grieco [10] were not fulfilled.

- Costing associated with the proposed interventions have not been produced. These are being determined in the National Musculoskeletal Medicine Initiative, and will be available late in 2000.
- A date of publication has been deferred until the NH&MRC has assessed the Guidelines.
- No review date is specified because there is no guarantee that the Faculty of Musculoskeletal Medicine will have the resources in the future to continue to update the Guidelines.

In accordance with the Guiding Principles of the NH&MRC [8]:

- The development and evaluation process of the present Guidelines was focused on the outcomes of safety, efficacy, and cost-effectiveness, with respect to pain and disability.
- The Guidelines were based on the best available evidence.
- Wherever possible, the evidence was synthesised on the basis of published systematic reviews where available, and an assessment of every available randomised controlled trial. Indeed, the literature is sometimes so meagre, that both approaches were used.
- When offered, statements or recommendations are accompanied by a statement of strength of evidence in terms of the Guidelines of the NH&MRC [9].
- As described below, the process of guideline development was novel, but involved multi-disciplinary review and consumers.

- The Guidelines are sufficiently flexible as to be adaptable to varying local conditions.
- Ironically, the implementation of the Guidelines requires no new resources, provided that practitioners are informed of them and abide by them. The cost of developing the Guidelines was borne by individual members of the Australasian Faculty of Musculoskeletal Medicine, with the technical support of staff of the National Musculoskeletal Medicine Initiative.
- The Guidelines have been in use for three years under the auspices of the National Musculoskeletal Medicine Initiative, in which their safety, efficacy and cost-effectiveness is being assessed by audit.

but

- There is no guarantee that the Guidelines will be updated regularly, for the Australian Faculty of Musculoskeletal Medicine does not have the resources to maintain the academic and technical staff require to maintain the Guidelines, and the National musculoskeletal Medicine Initiative shall terminate in July 2000.

Comparison with Other Guidelines

By definition, the present Guidelines are more up-to-date than previous guidelines [4,5], for they are based on literature published since those previous guidelines were prepared. The present Guidelines are only slightly more up-to-date than the Dutch Guidelines [6].

The present Guidelines are dissonant in certain respects from those of the AHCPR [4] and the UK [5]. This arises because those latter guidelines accepted consensus views in their recommendations, whereas the present Guidelines are explicitly evidence-based, in accordance with the second edition of the NH&MRC Guidelines for Guidelines which no longer recognises consensus or expert opinion as a form of evidence. In this regard, the present Guidelines are more in keeping with the Dutch Guidelines [6].

Compared with those of the NASS [11] and the AAOS [12], the present guidelines explicitly and exclusively address back pain, and do not address sciatica and disc herniation, which was the focus of these American guidelines.

Where the present Guidelines depart considerably from other and previous guidelines is that they address topics not entertained by other guidelines, such as history and examination, which are critical components of the assessment of patients with back pain. These topics were not addressed in an evidence-based manner by other guidelines. Whereas other guidelines focussed on the efficacy of treatments, the present guidelines have gathered the evidence-base for the reliability and validity of history, physical examination and investigations.

Conflict of Interest

Transparently and unashamedly, the present Guidelines have been developed with the medical practitioner in mind, particularly primary care practitioners, on the grounds that it is medical practitioners who have a comprehensive responsibility in the management of their patients. It is they who are ultimately responsible for the assessment and investigation of patients, prior to treatment; and it is they, who have the legal privilege and responsibility concerning the use of specific investigations for specific conditions, when the need for these arises.

With respect to treatment, comparisons between craft groups and different health professions are avoided as far as possible unless these are mentioned in the literature cited and are pertinent to the evaluation of evidence. Instead, treatments are evaluated in a generic sense, without specification of who did, who can, or who should, provide those treatments. It is the efficacy of the treatment, not the effectiveness of a craft group that is emphasised in these Guidelines.

Who

Instead of by a multidisciplinary panel, the present Guidelines were prepared by a single author on behalf of the Faculty of Musculoskeletal Medicine. Subsequently, draft Guidelines were circulated to other individuals who were invited to pass comments and make recommendations for their improvement. These individuals included members of the Faculty who were practitioners in primary care, specialists in pertinent medical disciplines, representatives from non-medical disciplines, and a consumer. Those individuals who participated in this process are listed in Table 1.1.

Primary Author	Professor Nikolai Bogduk	Musculoskeletal Medicine and Pain Medicine
Consultants		
Newcastle Bone and Joint Institute	Dr Gabor Major	Rheumatology
	Dr Geoff Booth	Rehabilitation Medicine
	Professor Joe Ghabrial	Orthopaedics
Australasian Faculty of Musculoskeletal Medicine	Dr Les Barnsley	Rheumatology
	Dr Wade King	Primary Care
	Dr David Vivian	Primary Care
	Dr Brian McGuirk	Occupational Medicine
	Dr Milton Cohen	Rheumatology
External	Professor Peter Brooks	Rheumatology
	Professor Gordon Waddell	Orthopaedics
	Mr Greg Schneider	Physiotherapy
	Dr Susan Mercer	Physiotherapy
	Dr Anne Wyatt	Education
	Ms Rebecca Coghlan	Consumer

Table 1.1. Participants in the development process of the present Guidelines.

The Guidelines were not circulated more widely in the first instance because their implementation was still being evaluated, and there was no intention to impose them, prematurely or pre-emptively, on the Australian community while that evaluation was still in progress.

Moreover, the Faculty considered that the NH&MRC was the appropriate body by which the Guidelines could be disseminated for public consultation and review. In that regard, although it has been the case that other evidence-based guidelines in Australia have been developed by the NH&MRC, the Guidelines for Guidelines [9] allow for externally developed guidelines to be approved by the NH&MRC. It is in that context that the present Guidelines for Acute Low Back Pain have been developed and presented.

What

These Guidelines are based on the proposition that the treatment, investigation, and assessment of acute low back is predicated by an understanding of the nature of back pain. Accordingly the material of these Guidelines is presented in three sections.

The first section, consisting of chapters 1 to 6 provides information on the definition of back pain, its taxonomy, its differential diagnosis, natural history, and prognostic factors.

The second section, consisting of chapters 7 to 10, addresses assessment with respect to history, physical examination, imaging, and psychosocial assessment.

The third section addresses treatment, and consists of 17 chapter that cover proven and contentious interventions.

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Chapter 2. Definition

Low Back Pain

Although the concept of "low back pain" might seem straightforward and self-evident, it may be surprising to others who do not practise in the field, that medical practitioners and other health professionals differ as to what they regard as "back pain". For this reason, the International Association for the Study of Pain (IASP)[1] provided definitions based on anatomical topography. The taxonomy does not recognise the colloquial term - back pain, but instead refers to different forms of spinal pain.

Lumbar Spinal Pain is pain perceived as arising anywhere within a region bounded superiorly by an imaginary transverse line through the tip of the last thoracic spinous process, inferiorly by an imaginary transverse line through the tip of the first sacral spinous process, and laterally by vertical lines tangential to the lateral borders of the lumbar erectores spinae.

Sacral Spinal Pain is pain perceived as arising from anywhere with a region bounded superiorly by an imaginary transverse line through the tip of the first sacral spinous process, inferiorly by an imaginary transverse line through the posterior sacrococcygial joints, and laterally by imaginary lines passing through the posterior superior and posterior inferior iliac spines.

The two definitions were provided because when a patient indicates sacral spinal pain but not lumbar spinal pain, practitioners should not presume or assume that this pain is referred from the lumbar spine, unless and until corroborating evidence is to hand. Without such evidence, sacral spinal pain should be identified as sacral spinal pain.

For pain overlapping between the lumbar and sacral regions, the IASP have provided another definition:

Lumbosacral Pain is pain perceived as arising from a region encompassing or centered over the lower third of the lumbar region as described above and the upper third of the sacral region as described above.

Lumbar spinal pain, sacral spinal pain, or lumbosacral pain, or any combinations thereof, legitimately constitute what colloquially might be referred to as "low back pain". These definitions explicitly locate the pain as perceived in the lumbar and/or sacral regions of the spine. In that regard, "back pain" does not refer to pain in the posterior thorax. That is more correctly referred to as thoracic spinal pain [1].

What do not constitute low back pain are ***loin pain*** and ***gluteal pain***. Loin pain is pain perceived over the posterior region of the trunk but lateral to the erector spinae [1]. Gluteal pain is pain in a sector centred on the greater trochanter and spanning from the posterior inferior iliac spine to the anterior superior iliac spine [1].

This distinction is made because the differential diagnosis and investigation of loin pain and gluteal pain are distinctly different from that of spinal pain. Not only does loin pain require consideration of visceral disorders, notably of the urinary tract, but it does not require, in the first instance, investigation of the lumbar spine. Gluteal pain is commonly a site of referred pain from the lumbar spine, but in the absence of lumbar spinal pain as a cue, local causes of gluteal pain should be considered first.

Perhaps most critically, back pain should not be confused with, or regarded as synonymous with sciatica or radicular pain. Although the latter may be caused by disorders in the lumbar spine, they are explicitly pains felt in the lower limb. And although back pain and sciatica often occur together, their causes are not necessarily the same; nor are their mechanisms; and the investigations and management of sciatica are different from those for back pain, as is the evidence-base for each of the two conditions. In that regard, the present guidelines pertain strictly to the complaint of low back pain. Sciatica and radicular pain are to be addressed in a separate document.

Acute, Subacute, And Chronic

There are many ways in which the terms - acute, subacute, and chronic, are used and defined. Some definitions gravitate to chronic pain being characterised by the degree of unrelenting suffering. However, the traditional and most common definitions are based on time. That system of definition is used for present purposes.

The IASP [1] recognises chronic pain, in general, as any pain that has persisted for longer than three months; although for research purposes, it prefers six months as the defining period.

By implication, acute pain is pain that has lasted for less than three months.

Some authorities use an additional term - subacute pain, to refer to pain that has persisted for longer than a brief period but not yet three months. Different authorities use different critical periods, but the one that has dominated the literature on back pain is five to seven weeks [2].

Accordingly for present purposes, the definitions are

Chronic low back pain	Low back pain that has been present for at least three months
Acute low back pain	Low back pain that has been present for less than three months
Subacute low back pain	Low back pain that has been present for longer than five to seven weeks but not longer than 12 weeks

Under those definitions, subacute low back pain is a subset of acute low back pain, and consequently falls under the terms of reference of these guidelines. The distinctions between acute, subacute, and chronic low back pain are important because the biological basis, natural history, and response to therapy are different for each category.

What is difficult to define are the entities of recurrent low back pain, and acute on chronic back pain. In these presentations, the patient does not suffer persistent or continuous pain, but has a period relatively free of pain but punctuated by episodes that, in a different context, would constitute acute back pain.

When a patient suffers recurrent episodes of pain, but each is separated by a pain-free period of at least three months, each episode satisfies the definition of acute low back pain.

When a patient suffers a continuous, or essentially continuous, but low level of back pain punctuated by exacerbations of pain (each of which might be referred to as "acute"), the patient is most comfortably defined as having chronic back pain, on the grounds that the adjectives- acute or chronic, refer to the duration of pain, not its severity.

Episodes of pain that recur within periods less than three months in duration do not lend themselves to classification as acute or chronic. These are perhaps best defined as recurrent back pain, with the descriptors - acute or chronic, being promoted to defining the length of period over which the recurrences have occurred.

Referred Pain

In its broadest sense, referred pain is pain perceived in a region displaced or remote from the actual source of pain. It can occur by either of two mechanisms, depending on the nature of the stimulus that produces the pain.

Somatic referred pain is pain perceived in a region innervated by nerves or branches of nerves other than those that innervate primary source of pain, where that source lies in one of the tissues or structures of the body wall (soma) or limbs [1]. A similar definition applies to *visceral referred pain*, save that the primary source lies in one of the organs of the body. In both somatic and visceral pain the primary pain is evoked by the stimulation of the peripheral endings of nociceptive afferent fibres. The referred pain is evoked when these afferents converge on second-order or third-order neurons in the central nervous system that happen also to receive afferents from the region to which the pain is referred.

In contrast, *neurogenic pain* is pain evoked by the stimulation of peripheral axons or their cell bodies, (rather than their peripheral endings). *Radicular pain* is a subset of neurogenic pain, in which pain is evoked by stimulation of the nerve roots or dorsal root ganglion of a spinal nerve [1]. In neurogenic pain, the pain is perceived in the peripheral territory of the affected nerve. In as much as the pain is perceived in a region remote from the actual source of pain, neurogenic pain is, by definition, a form of referred pain. It differs, however, from somatic and visceral referred pain in that it does not involve the stimulation of nerve endings, and does not involve convergence. Rather, it is perceived as arising from the periphery because the nerves from that region are artificially stimulated proximal to their peripheral distribution.

The mechanisms, features, investigation, and treatment of somatic referred pain and radicular pain are each distinctly different. The need to distinguish the two is paramount lest patients be inappropriately investigated and treated. This theme is developed in Chapter 7.

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Chapter 3. Taxonomy

It has been traditional in medical practice and in other fields of health practice, to apply a label to a patient's presentation in the name of diagnosis. Such a label serves two major purposes:

it indicates to the patient that the practitioner recognises and knows what is wrong with the patient;

it implies a particular cause of the complaint, and implies an appropriate treatment.

Whereas these purposes are perhaps served well in other areas of Medicine, they serve poorly in Pain Medicine, and very poorly for low back pain.

For a diagnostic label to be correct it must be both reliable and valid. Yet, for many, and for the most common pain conditions, diagnoses that have been applied in the past have been shown to lack reliability, validity or both; or are of unknown reliability and validity. With respect to back pain, ostensibly the same condition might be diagnosed as "segmental dysfunction" by one practitioner, but as "facet syndrome" by another. The IASP [1] referred to this problem as the "tower of Babel" - the use of many languages to describe the same thing.

In an effort to reduce confusion and conflict, and in order to promote a uniform vocabulary, the IASP produced a taxonomy of pain terms and classification of painful disorders, now in its second edition [1]. With respect to low back pain, the Taxonomy entertains some ** conditions. For each it prescribed essential criteria that should be satisfied before the corresponding diagnostic label is used. Four categories of rubrics can be found:

1. those applying to pathologically distinct entities, such as tumours, infections, and fractures of the spine.

   For these conditions, there is no ambiguity about the use of the corresponding rubric, because the diagnostic criteria require demonstration of the lesion implied by the rubric, usually by medical imaging, or by tissue sampling in some instances.

2. those applying to entities embraced by certain practitioners or craft groups, such as "segmental dysfunction", "ligament sprain", and “muscle spasm".

   For these conditions, explicit criteria are prescribed, but close inspection reveals that, at present, these criteria could not be satisfied in clinical practice, because the tests required have not been validated.

3. those applying to distinctive entities, but which require invasive tests, such as diagnostic blocks or discography, before the criteria can be satisfied.

   For practical purposes, such invasive tests are not appropriate for patients with acute low back pain; they are usually reserved for patients with chronic low back pain. Consequently, the rubrics that pertain cannot be applied to acute low back pain.

4. lumbar spinal pain of unknown origin.

The IASP maintained that factitious or specious diagnostic labels should not be applied to patients with pain; nor should otherwise legitimate labels be gratuitously applied, or applied as "suspected", when the related diagnostic criteria were frankly not satisfied. The objective of this injunction was to prevent patients from being misdiagnosed and mislabelled, when the label might have satisfied the practitioners desire to demonstrate that they knew what they were doing, but when the label applied lacked validity, therapeutic utility, or both.

Although the IASP recognised that a rubric such as "lumbar spinal pain of unknown origin" could be dissatisfying, both to the practitioner and to the patient, it preferred to encourage honesty in diagnosis, rather than perpetuate or endorse invalid diagnostic practice that created illusions both for practitioners and for patients, and which could lead to inappropriate treatment.

Consequently, the only honest and legitimate diagnostic label that might be applied, in the first instance, to a patient presenting with acute low back pain is "lumbar spinal pain of unknown origin". Unfortunately, this term is no more than a substitute for "low back pain". However, it is more honest intellectually than a host of pseudo-labels that have been used in the past.

Medical practitioners from other fields of Medicine might find this taxonomy dissatisfying. It is tantamount to referring to angina pectoris as "chest pain". However, what should be realised is that whereas other fields of medicine have benefited from clinico-pathological correlations, and can usually apply expeditious investigations (like chest X-ray and ECG) in order promptly to formulate a clinical diagnosis, those advantages do not apply to back pain. No pathognomonic clinico-pathological correlations have been established, and simple investigations are usually non-contributory. Consequently, the same sophistication in diagnosis as applies in other fields of Medicine cannot apply to back pain. In essence "low back pain" cannot be resolved clinically, as can "chest pain" or "abdominal pain". Nor, as it shall be shown, is it necessary to do so in the vast majority of cases.

For some practitioners, the suffix - of unknown origin, may be disconcerting, for it could be inferred to mean that the practitioner has no idea about what is wrong with the patient. In all stringency, the suffix means that the source or cause of pain cannot be explicitly stated. Moreover, the suffix allows for any and all possible causes of pain, including psychogenic pain. Practitioners wishing to be somewhat more explicit, and at least indicate that they are confident that the back pain is not visceral in origin, and not psychogenic, but stems from somewhere within the patient's lumbar (or sacral) spine could perhaps avail themselves of the term - **somatic lumbar spinal pain**. This term avoids conveying to the patient that the pain could be due to anything (which is neither satisfying nor reassuring), but at least conveys the impression that the practitioner knows approximately what is wrong but can't be certain at present.

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Chapter 4. Differential Diagnosis

The literature abounds with suggestions and proclamations about what the causes of low back pain may be. However, compelling data are scarce.

Systematically, the possible causes of low back pain can be summarised in an anatomical-pathological matrix (Table 4.1.) A summary of the literature describing these various causes, and analysing its quality is available elsewhere [1].

PATHOLOGY	ANATOMICAL SITE					
	MUSCLE	FASCIA	LIGAMENT	BONE	JOINT	DISC
TRAUMA	sprain	tear	sprain	fracture	sprain	sprain
FATIGUE FAILURE				fracture		internal disc disruption
INFECTION	abscess			osteomyelitis	arthritis	discitis
INFLAMMATION	myositis		enthesopathy		arthritis	
TUMOUR	sarcoma			primary metastatic	primary	
MECHANICAL / PHYSIOLOGICAL	spasm trigger points	compartment syndrome			"dysfunction"	

Table 4.1. *A systematic summary of the possible causes of low back pain in terms of anatomy and pathology. Muscle: refers to any of the muscles of the lumbar spine. Fascia: refers to the thoracicolumbar fascia. Ligament: refers to the interspinous and iliolumbar ligaments. Bone: refers to any part of the lumbar vertebrae or sacrum. Joint: refers to the lumbar zygapophysial joints or the sacroiliac joint. Disc: refers to the intervertebral discs.*

Not included in the table are metabolic disorders of bone, such as osteoporosis, which are not known to cause pain in their own right. Nor is it the purpose of this chapter to debate if and how particular entities cause pain. Rather, the purpose of this synopsis is to set the scene for following chapters in which the assessment of patients and the pursuit of diagnosis are addressed.

In essence what can be gleaned from Table 4.1, is that there are certain conditions such as tumours and infections, that are important because they pose an immediate threat to the patient's health; and fractures, which may pose a threat to the integrity of the patient's spine and central nervous system. These conditions have become known collectively as "**red flag conditions**" on the grounds that any hint of their presence in a patient should sound an alarm to the treating practitioner, as if an imaginary red flag were to wave in their mind. Otherwise there are conditions attributed to minor trauma or fatigue failure, or to idiopathic mechanical or physiological disturbances. In contrast to red flag conditions, these conditions do not constitute a major threat to the patient.

Absent from the table are "degenerative joint disease" and "osteoarthritis". These have been excluded because they are not recognised by the IASP [2] as causes of low back pain, on the grounds that the correlation between pain and their radiographic presence is poor, and certainly not diagnostic.

Iliac Crest Syndrome

The entity of iliac crest syndrome has attracted some attention in the rheumatology and related literature. It has been described and promoted as a legitimate, distinctive entity. Its diagnostic feature is said to be tenderness over the superomedial aspect of the iliac crest. Indeed, detection of this sign has been shown to be quite reliable, with a kappa score of 0.6 [3]. Moreover, the condition is quite common, being evident in some 30% to 50% of patients with low back pain in general practice [4].

However, there is no evidence of its mechanism or cause. Conjectures include sprain of the lumbar intermuscular aponeurosis [5] sprain of the iliolumbar ligament [6,7,8] , sprain of the multifidus muscle [9.10], sprain of the gluteus maximus muscle [11], trigger point activity in quadratus lumborum[12,13] , muscle imbalance [14], and entrapments of the lateral branches of the lateral branches of the lumbar dorsal rami in the fascia attached to iliac crest [15]. However, no compelling data implicate any of these specific conditions.

Consequently, this purported syndrome constitutes no more than a single, clinical sign. Although the sign may be reliably detected, it does not constitute a legitimate diagnosis.

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Chapter 5. Natural History

In the context of low back pain, natural history is not simply a conventional chapter that epidemiologists contribute to the description of a disease. It is of paramount importance in two clinical domains.

First, it constitutes the baseline against which all treatments need to be assessed. If acute back pain has a relatively good natural history, uncontrolled studies of treatment will be rewarded with apparently high rates of success. Consequently, controlled studies need to be designed with the natural history in mind, in order that they have sufficient statistical power to demonstrate attributable effect beyond that of spontaneous recovery.

Secondly, natural history affects prognosis; and if the natural history favours recovery, this can be captured to provide reassurance to patients on a scientific basis, instead of *ad hoc* optimism.

Epidemiological Data

Traditional wisdom maintains that most patients with low back pain will recover; rules of thumb obtain such as "90% of patients recover within 2 months". Various authorities (see Von Korff [1,2] for review) have endorsed such rules. However, these optimistic rules are not consistent with contemporary evidence obtained from prospective studies.

Although one study in a primary care setting did find that 90% of patients with acute low back pain recovered within two weeks [3], it enrolled patients within two weeks of onset but followed them for only four weeks. Others found lesser rates of recovery within this time of 62% [4], 28% [5] or 33% [6]. Furthermore, most studies that have attempted to describe the natural history of acute low back pain have followed their patients for only one [3,6], three [5,7], or six [8] months. A more revealing picture is provided by studies that followed patients for at least 12 months.

The study of Klenerman et al[9] reported that those patients who had not recovered by 2 months after the onset of their pain remained in pain at 12 months. Thus, the 2-month status of patients is an indicator of their 12-month status. Klenerman et al [9] reported that only 7.3% of their inception cohort became chronic. However, this may be an underestimate because these investigators followed through 2 months and 12 months only 123 of their original 300 patients.

ONSET OF BACK PAIN	PROPORTION OF PATIENTS BY PAIN STATUS AT 12 MONTHS				
	NO PAIN	LOW DISABILITY LOW INTENSITY	LOW DISABILITY HIGH INTENSITY	HIGH DISABILITY MODERATELY LIMITING	HIGH DISABILITY SEVERELY LIMITING
RECENT	0.21	0.55	0.10	0.06	0.08
NON-RECENT	0.12	0.52	0.16	0.11	0.09

Table 5.1. *Outcome of low back pain, 12 months after first consultation, based on Von Korff et al [10]. Recent onset was defined as pain commencing within 6 months of first interview.*

Von Korff et al[10] referred to earlier studies, which indicated that some 40% of patients remain in pain at 6 months, or that 62% of patients suffer a relapse within 1 year. Their own study [10] provided detailed data. During the 12 months following the onset of back pain, patients can expect either to recover or to remain in pain of various intensities associated with various degrees of disability. The probability of outcome is a function of the mode of onset of pain (Table 5.1). These somewhat pessimistic figures of Von Korff et al [10], however, possibly arise because their inception cohort consisted of patients who had been in pain for up to six months.

A British study [11] underscored the illusion that is created when practitioners believe that if a patient has not returned they must have recovered. Of 463 patients presenting with a new episode of low back pain, 59% had only a single consultation, and 32% had repeat consultation confined to the three months after the initial consultation. However, independent review at three months and at 12 months revealed that only 21% and 25% respectively had completely recovered. These proportions echo the figures of Von Korff et al [10] in the United States.

More optimistic figures arise from a Dutch study [12] of 443 patients, 342 of whom had an onset of pain within the preceding seven weeks. The median time to recovery was seven weeks (interquartile range: 3-16 weeks), with 70% still having pain at four weeks, 48% at eight weeks, and 35% after 12 weeks. At 12 months, 10% of the patients still had back pain. Strikingly, however, the recurrence rate was high. Some 76% of patients endured a relapse. The median number of relapses was two (interquartile range: 1-3), with a median time to relapse of seven weeks (interquartile range: 5-12), and a median duration of three weeks for the first relapse, two weeks for the second and third, and one week for the fourth.

Key Points

- When patients do not return for treatment or for follow-up, they have not necessarily recovered. In fact, it is likely that they have not recovered, and simply don't return.
- Patients are likely to recover from their presenting episode of back pain.
- The median time to recovery is about seven weeks; but
- Relapses are common; and
- Up to 80% of patients may remain disabled to some degree at 12 months; although
- Perhaps only 10% - 15% will be highly disabled.
- The status of the patient at 2 months is an indicator of their status at 12 months.

Implications

These figures allow the practitioner to be optimistic, although guarded, about prognosis. They can advise patients that they are likely to recover from the presenting episode; but practitioners should also plan for recurrences, for these are likely. The window of therapeutic opportunity seems to be about two months. Patients who have not recovered, or are not recovering by this time, will require more concerted effort in management.

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Chapter 6. Prognostic Factors

Definition

Prognostic risk factors are features exhibited by patients with back pain early in the course of their problems that correlate statistically with whether or not they are likely to develop chronic disability because of back pain.

Prognostic risk factors, which predict chronicity, should not be confused with standard risk factors, which predict whether or not an unaffected individual will develop back pain in the first instance.

Objectives

The pursuit of prognostic risk factors in back pain is driven by the prospect that appropriate intervention, early in the course of the problem, directed at the risk factor may reduce chronic disability.

This paradigm contrasts to standard medical management in which the imperative is to establish a diagnosis of the primary, biological basis for the patient's pain, and to rectify the abnormality, thereby eliminating pain and any risk of chronicity. However, conventional medical management of acute back pain is thwarted on two counts:

> In most cases a diagnosis cannot be made by simple clinical examination or by medical imaging (see Chapters 8 and 9); and even though a diagnosis might be established using sophisticated, invasive techniques [1], it is inefficient to apply these techniques to every patient with acute back pain because many patients will recover regardless of diagnosis or therapy (Chapter 5). Sophisticated techniques of diagnosis are best reserved for patients with chronic back pain.
>
> Few specific treatments for acute back pain have been validated leaving only non-specific management (see Chapters 12-27).

The failure of conventional medical management leaves the management of acute back pain open to different paradigms such as the correction of prognostic risk factors.

The Model

Two broad categories of prognostic risk factors can be described. These are Biological Factors - that encompass the patient's demographic and clinical features, and Psychosocial Risk Factors - that encompass how the patient thinks, feels and behaves (Figure 6.1).

In each category there are immutable and potentially remediable factors. Immutable Biological Factors might include age, gender and race. Even if these were cardinal predictors of chronicity, they cannot be changed.

Potentially remediable Biological Factors include:

> diagnostic features of specific conditions that can be corrected, such as fractures and infections; but by and large, these occur only in the minority of cases that are categorised as "red flag" conditions (see Chapter 7);
>
> associated features, such as muscle weakness, immobility or lack of fitness, and it is these features that have attracted interventions such as exercise and functional restoration (see Chapters 14 and 22).

Immutable Psychosocial Factors might include personality type and past history of psychological distress. Relatively Immutable Psychosocial Factors might include socio-economic status, intelligence, job dissatisfaction and education. Potentially remediable Psychosocial Factors might include beliefs, cognitions, and fears; and it is these latter features that have attracted attention in the contemporary management of back pain, in parallel with remediable Biological Factors.

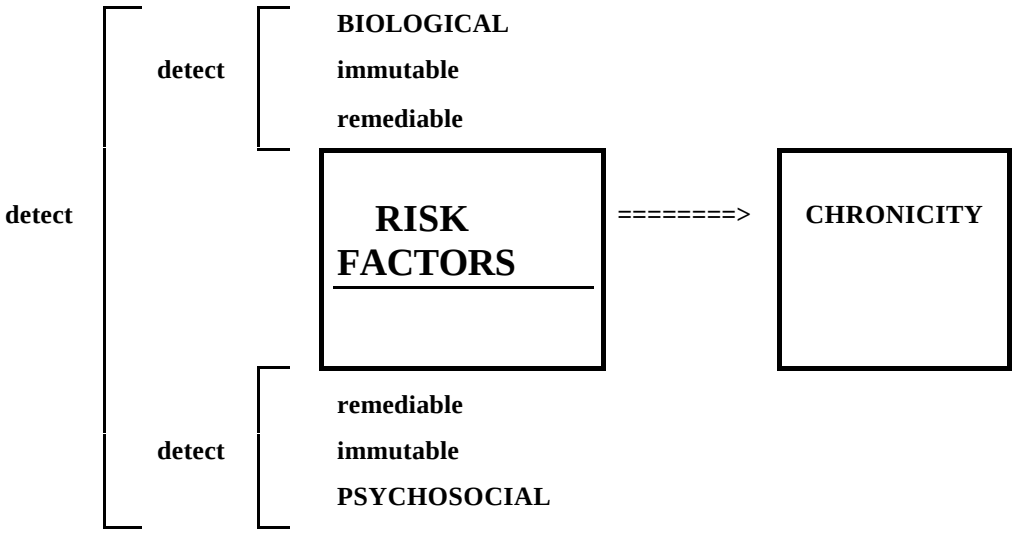

Figure 6.1 *A model of prognostic risk factors. The objectives of research are to detect the risk factors for the development of chronicity of back pain. The factors may be biological or psychosocial, and immutable or remediable. Research may focus on detecting psychosocial or biological factors or both.*

The Factors

In the search for prognostic risk factors the frailties of poor clinical epidemiology obtain. Observer bias - deliberate or subconscious, can affect what is detected. The results of epidemiological surveys are constrained by the devices used. Any questionnaire will contain a finite number of possible factors. Any that emerge as statistically significant must be asked about in that questionnaire. If an investigator does not consider and include a particular factor, he or she will not find that factor to be significant. Thus, the results of any survey will be a function of what is asked. In broad terms, if a survey focuses on Psychosocial Factors it will likely find one or more to be significant but, by definition, will find no Biological Factors to be significant. Conversely, if a survey addresses only Biological Factors it will never find Psychosocial Factors to be significant.

Illustrative in this regard are two studies from the same unit. The first study [2] addressed only demographic and clinical features, and found frequency of pain, duration of pain, playing adult sport, inability to perform sit-ups, inappropriate signs, and leg pain to be significant predictors of poor outcomes. However, the second study [3] included psychosocial factors and found depressive symptoms, coping strategies, somatic perception, as well as leg pain and duration, to be significant predictors of poor outcome.

Factors that appear significant when a small list of possibilities is considered may not remain significant if diluted in a larger list of possibilities; and factors that appear significant on univariate analysis may lose their significance on multivariate analysis. Reliable are only the most rigorous studies that consider an initial large number of possible factors and submit them to multiple-regression analysis in order to eliminate the spurious factors and identify the dominant factors.

Thereafter, it is the responsibility of the investigators to determine how much of the variation between patients is accounted for by the factor or factors identified as significant. This has rarely been done in the back pain literature. Instead, authors have been satisfied to take factors that are statistically significant and promulgate them as if they were major determinants of chronicity - almost as if they were "the answer to chronic back pain"; yet the factor may account for only a small proportion of the variance amongst patients. Although it may be worthwhile to identify potentially remediable factors, the eventual impact will be small if the factor accounts for only a small proportion of the problem.

Epidemiological studies that have looked for prognostic risk factors for back pain have varied in methodological rigour, from consensus summaries to exhaustive iterations of regression models [2-21]. No study is perfect. What it may make up for in methodological rigour may be compromised by an inappropriate or unfair selection of putative factors. On the other hand, factors found in weaker studies have usually been denied in more rigorous studies that addressed the same putative factors but included others that proved to be more discriminating.

Without venturing to rank individual studies for rigour and reliability, the cardinal prognostic risk factors that have been identified for chronicity of back pain are listed in Table 6.1. Those factors identified in methodologically more rigorous studies are shown in upper case, while those factors found in less robust studies are shown only in lower case. Those factors listed in parentheses are ones detected in weaker studies but explicitly denied in stronger studies.

	BIOLOGICAL	**PSYCHOSOCIAL**
IMMUTABLE	(age) (gender) (race) frequency of attacks playing adult sport DURATION PAST HISTORY OF BACK PAIN	marital status family status
RELATIVELY IMMUTABLE	severity job demands LEG PAIN	compensation employment wage occupation somatisation JOB DISSATISFACTION EDUCATION MMPI
POTENTIALLY REMEDIABLE	smoking BMI inability to sit-up WORK CAPACITY DISABILITY	inappropriate signs lack of understanding SICKNESS IMPACT DEPRESSION COPING DISTRESS RATING OF LOADS FEAR

Table 6.1. Prognostic risk factors for chronicity of back pain.

What is evident from this table is that the strongest and potentially remediable factors are clustered in the psychosocial category. They paint the picture that those patients at risk of developing chronicity tend to be those who are depressed, focused on their complaints, are unable to cope with their pain, and most significantly - who are fearful of aggravating their pain. It is this constellation of factors that has generated contemporary interest in psychosocial management of back pain (see Chapters 10 and 19).

However, before endorsing that paradigm, it is salutary to recognise the strength of these risk factors.

> Bigos et al [12] reported that individuals with high scores on scale 3 of the Minnesota Multiphasic Personality Inventory had an 18.6% chance of reporting back pain during a three year period, compared with 5.5% for individuals with low scores. Further analysis [16] showed that of patients with scores in the highest quintile, only 12% reported back injury.
>
> Burton et al [3] found that conventional clinical information correctly predicted outcome in only 10% of patients with acute back pain, but psychosocial factors correctly predicted 59%. Collectively those factors were depression, coping strategies, and somatic perception.
>
> Troup et al [20] determined that a battery of psychophysical lifting tests, including rating what constituted an acceptable load, was predictive of whether a patient had no pain, acute back pain, mild back pain or chronic back pain. These factors had an overall accuracy of 35% for men and 37% for women.
>
> Croft et al [6] reported that psychological distress, as measured by the General Health Questionnaire, predicted 16% of recurrences of back pain in their sample.
>
> Klenerman et al [18] found that demographic, historical and fear avoidance factors accounted for 12%, 15% and 14% respectively, of the variance in predicting outcome from acute pain to pain and disability at 12 months.

Thus, although these factors are significant and substantial predictors of chronicity, none alone is the predominant factor. Each still accounts for only a small proportion of the influences that determine chronicity. This has ramifications for any interventions based on trying to correct these factors. If the factor accounts for only a small proportion of the variance between patients who recover and who become chronic sufferers, even the most efficacious intervention is destined to have only a minor impact on the overall burden of illness.

It should also be recognised that a single risk factor alone carries little prognostic significance. In this regard, a recent study [22] has highlighted the importance of multiple, simultaneous factors. In that study, the cardinal risk factors for chronicity identified were history of low back pain, dissatisfaction with current employment or work status, widespread pain, radiating leg pain, restriction in two or more spinal movements, and gender. Of patients with none, one or two risk factors, only 6% become chronic sufferers. The corresponding percentages for those with three or four factors were 27% and 35%; but of patients five or six factors, 70% become chronic.

The Fear-Avoidance Model

Eminent authorities have taken pains to point out that psychosocial risk factors do not mean that the patient has psychogenic pain [23]. Rather, distress and illness behaviour is secondary to the physical disorder, but physical disorder, distress and illness behaviour combine to produce disability [24,25].

Whereas disability might, in the first instance, be considered a Biological Factor - in that the patient appears physically to be unable to execute certain activities, there is growing evidence that such intolerance of activity may have a substantial behavioural basis and, therefore, more appropriately constitutes a Psychosocial Factor.

The relationship between disability in activities of daily living and severity of pain is weak. Severity of pain accounts for only some 10-14% of the variance of physical disability [23,26] and only 5% of the variance for work lost [23]. Rather, much of the variance can be explained by a combination of severity of pain, depression and illness behaviour [27]. In turn, cognitive measures, particularly catastrophising, explained 35% of the variance of the depressive symptoms associated with chronic low back pain [27].

Such relationships have led to the generation of a Fear-Avoidance model that incorporates various psychosocial factors to explain how they bear on the patient's complaint of pain and their behaviour. This model has been developed and promulgated in the context of back pain by a variety of separate groups [18,23,28-31], and its key elements are summarised in Figure 6.2.

The model maintains that a patient's disability is a function not only of their pain but also of their response to it. The model does not stipulate that psychological factors generate the pain. Indeed, the evidence is that disability is independent of the severity of the pain [31]. Rather, disability seems to arise because patients seek to avoid exacerbations of their pain. Consequently, avoidance behaviour dominates their activities of daily living. Avoidance patently does not reduce the intensity of persisting, chronic pain; the patient always has that; but it is the aggravation of pain that patients seek to avoid.

The model maintains that avoidance behaviour is based on experience, memory, cognitions and beliefs. It is largely the experience of patients that attempting activities aggravates their pain. How they deal with this experience and its memory depends on a variety of other factors.

Cognitions are reasoned thoughts that the patient may have about their pain; they are logical but may be based on limited knowledge or understanding. Thus, a patient may reason logically that - "if activity aggravates my pain I should avoid it"; but they may not be informed that activity is beneficial. The patient may reasonably believe that rest promotes healing and that activity disrupts healing. Cognitions may be reinforced if avoidance of activity is rewarded by attention or excuse from social obligations.

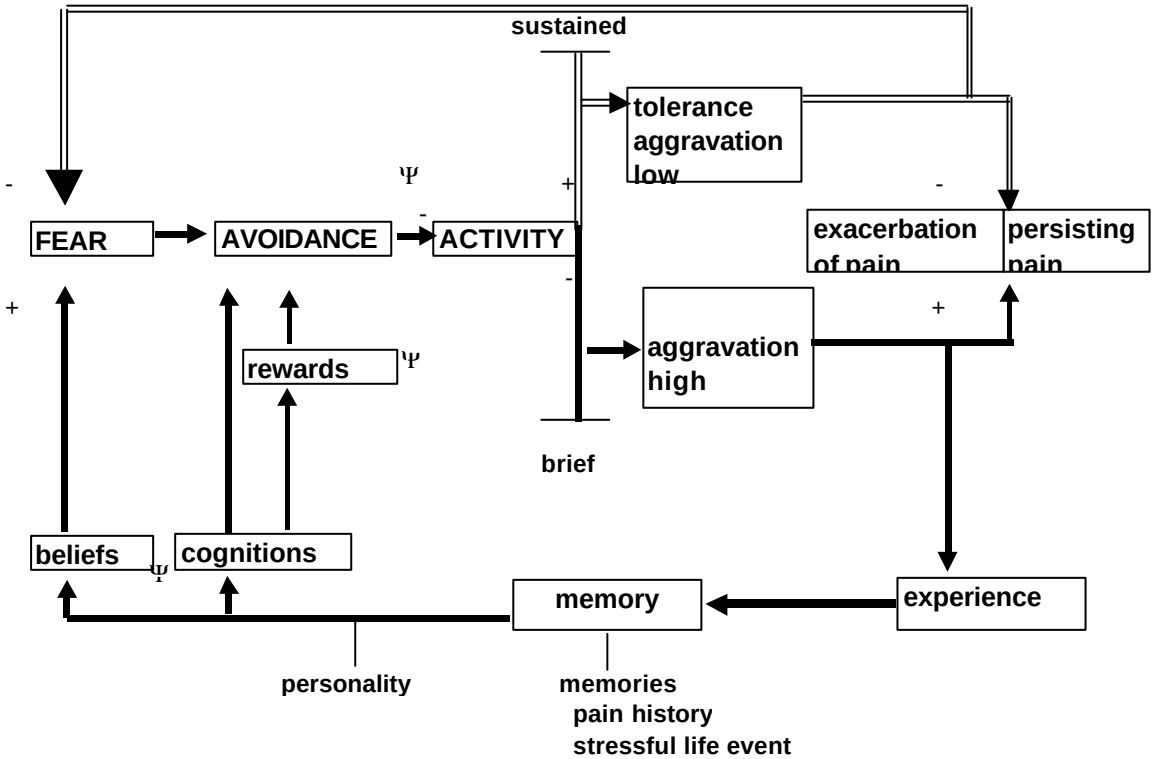

Figure 6.2. *The fear-avoidance model of back pain. Sites at which behavioural therapy might be applied are marked Y.*

Beliefs are less rational thoughts that may be related to emotions. Fear is one such emotion. Thus, a patient may avoid activity for fear of aggravating their pain, as opposed to reasoning logically that activity will lead to aggravation. They may believe that pain is a sign of impending disaster, and therefore reason that avoiding pain will avoid disaster. They may fear that they will not be able to cope.

Beliefs can be influenced by other factors such as past history of pain, and previous stressful life events [28,31], and personality. It is believed that hypochondriasis and hysteria, as measured by the MMPI, serve to reinforce avoidance [28].

As a result of these influences, a patient consciously or unconsciously may elect either to confront or avoid their problem with pain. So-called "confronters" will view their pain as a temporary nuisance, will be motivated to return to activities, and are prepared to address how to manage their pain [28]. "Avoiders" avoid the pain experience and avoid painful activities [28].

Several deleterious consequences are believed to arise from avoidance behaviour[31]. First, it patently does not reduce pain, and is, therefore, unproductive. Secondly, avoidance behaviour reduces physical and social activity and may lead to "invalid" status [28]. Fear-avoidance beliefs correlate strongly with self-reported disability in activities of daily living and with work loss, and account for 23% of variance of disability in activities of daily living, and 26% of the variance of work loss [23].

The crux of fear-avoidance is that the patient believes or reasons that because activity aggravates their pain, activity should be avoided lest the pain be made worse. The irony of fear-avoidance is that some evidence indicates that forced exposure to aversive stimuli actually increases tolerance [31], and, therefore, reduces the experience that activity aggravates pain. This is in keeping with beliefs in Musculoskeletal Medicine and Pain Medicine that persisting with movement despite pain facilitates recovery (see Chapter 12) and with the principles of therapy for phobias [31].

The predictions of the Fear Avoidance model [31] are that:

> preventing withdrawal and avoidance, and encouraging repeated graded exposures to stimuli previously avoided will lead to the greatest reduction in avoidance behaviour, and to the largest shifts in self-efficacy, judgements, and expectations; and
>
> behavioural therapy should be efficacious by encouraging increased activity, and by providing cognitive skills.

For these reasons behavioural and cognitive therapy approaches have been developed by physicians and by psychologists for the management of back pain (see Chapter 19).

Questionnaires have been developed to screen for fear-avoidance behaviours [23,29,30], and constitute suitable checklists for physicians wishing to identify systematically indicators of fear-avoidance behaviour in their patients (see Chapter 10).

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Chapter 7. History

History is the most critical component in the assessment of a patient with low back pain. In detecting clues of red flag conditions, history is more practical and more efficient than clinical examination and investigations.

A systematic approach to obtaining a history of low back pain ensures that practitioners do not forget or neglect features that could be important, but which in the heat of busy practice might lapse from an enquiry. A system that lends itself to this purpose is one that was developed for headache [1]. It invites obtaining a history in the categories listed in Table 7.1.

Presenting Complaint
Length of Illness
Site of Pain
Location and Extent of Spread
Quality
Severity
Frequency
Duration
Time of Onset
Mode of Onset
Precipitating Factors
Aggravating Factors
Relieving Factors
Associated Features

Table 7.1. *Categories under which history can be obtained systematically about any pain problem.*

In the context of low back pain, some of these categories will not be particularly relevant or contributory. However, rather than assuming that a particular category will be irrelevant, it takes little time to enter a null response or "not applicable". Yet doing so ensures that every history is systematically recorded; which ensures that no category is omitted or neglected because the practitioner forgot to ask. This virtue becomes more pertinent for medico-legal purposes. If a practitioner is accused of missing a diagnosis or a cue to a diagnosis, a record of "null" under the relevant point may constitute valuable evidence that the practitioner was not negligent when taking the history.

Particulars

Presenting Complaint

When a patient presents with a complaint of low back pain, it is imperative to establish before anything else that they do, indeed, have back pain. In that regard, the definitions provided in Chapter 2 are pertinent. The patient should have lumbar spinal pain, sacral spinal pain, or lumbosacral spinal pain. These should be distinguished from loin pain and gluteal pain, which have a different differential diagnosis, and attract a different system of assessment and investigation.

Length of Illness

It is critical to establish if the patient has acute, subacute or chronic low back pain, for the management options for each are quite different. For example, imaging is rarely indicated in acute low back pain but may be more pertinent for chronic back pain (see Chapter 9); intensive multidisciplinary therapy may be appropriate for subacute or chronic low back pain but has been proven to be inefficient for acute low back pain [2].

Site

For the reasons outlined under "Presenting Complaint", the site of pain should be accurately determined. To be considered as suffering low back pain, the patient must indicate lumbar spinal pain or sacral spinal pain.

In some instances, the patient may have pain arising from a region greater than that defined as spinal pain. Attention should be paid as to whether the patient has more than one pain problem, or has spinal pain that is also referred.

If the patient has more than one pain, each of which is ostensibly primary and presumably separate in origin, a separate history should be taken of each. Each might have a different cause and mechanism requiring different investigation and management. If subsequently it proves that the patient has multiple complaints ascribable to the one source, it is an easy matter to recombine the separate histories. However, assuming in the first instance that they have only one complaint can cause difficulties if a separate pain, that deserves separate management, is mistaken as part of another complaint.

Location and Extent of Spread

Low back pain may be referred to the lower limb girdle, the lower limb, and into the groin or perineum. The patient will feel pain in the back as well as in any of these regions, but they will not know if they have referred pain. The cardinal cue is that their pain is principally in the back. In order to establish this, enquiry should be directed to asking:

> "Where is your main pain; where is the pain worst; where do you feel pain most often, most consistently?", and reciprocally:
>
> "Where do you feel the pain only sometimes?".

A patient will be describing referred pain when they indicate low back pain as the consistent site, with pain in the limb occurring only sometimes; when the back pain is worse than the limb pain; or when the back pain clearly appears to spread into the lower limb. A patient, who describes equal pain in the back and the limbs, or in other regions, may be describing a problem that is not spinal referred pain. Such patients require a more perspicacious assessment, lest they have multiple pain problems, or a problem that, in common, causes referred pain to the back as well as to the limbs or other regions.

It is critical to establish if pain in the lower limb associated with low back pain is somatic referred pain or radicular pain. There is no absolute rule by which this distinction can be made, nor is there a good body of evidence that relates clinical features and proven sources and mechanisms of pain. However, there is sufficient evidence from experiments on normal volunteers and some clinical studies that allows the guidelines shown in Tale 7.2 to be formulated.

Two possible dilemmas arise. A patient may have both radicular pain and somatic referred pain, or a patient may have "early" radicular pain.

It is possible for a disorder of the lumbar spine to produce both somatic referred pain and radicular pain. A disrupted disc may cause spinal pain and referred pain, but an associated prolapse may add radicular pain to the clinical picture. Alternatively, an inflammatory response to prolapsed disc material may irritate the dural sleeve of a nerve root as well as the roots themselves. The dural inflammation may cause spinal pain and referred pain, while the root inflammation may cause radicular pain. In both instances the distinction is made by perceiving that the patient has the features of somatic referred pain upon which are superimposed the features of radicular pain. The error that can be made is to assume that all the pain in the lower limb is radicular, instead of recognising the combined state. The distinction is critical because whereas investigations might reveal the cause of the radicular component, the same investigations will not necessarily reveal the cause of the somatic referred pain. Nor will treatment of the radicular component necessarily relieve the somatic component.

FEATURE	EXPLANATION
Pain in the buttock or proximal thigh is unlikely to be radicular pain.	*When produced experimentally, radicular pain is perceived travelling distally into the lower limb [3]. Somatic referred pain stemming from the lumbar zygapophysial joints is most commonly perceived in the gluteal region and proximal thigh [4,5,6].*
Pain extending below the knee is not necessarily radicular pain.	*Although radicular pain characteristically extends into the leg, somatic referred pain can also be perceived below the knee, even into the foot [4,5].*
Pain extending across a relatively wide region, and felt deeply, in a relatively constant or fixed location is somatic referred pain. Its boundaries may be hard to define, but its centroid is clearly perceived by the patient.	*These are characteristic features of somatic referred pain that have been produced experimentally [7,8], and relieved by anaesthetising somatic structures in the lumbar spine [4,5,6].*
Pain that travels along the length of the lower limb, along a narrow band, will be radicular pain.	*This is the distinguishing topographic feature of radicular pain that has been evoked in volunteers by stimulating nerve roots [3]. Distribution along a narrow band has not been produced by stimulating somatic structures nor shown to be relieved by anaesthetising somatic structures.*
A patient does not necessarily have to exhibit neurological features to be suffering from radicular pain, but the presence of neurological features favours radicular pain, provided the preceding features are satisfied.	
Additional distinguishing features lie in the quality of pain (see below).	

Table 7.2. *Distinguishing features between somatic referred pain and radicular pain in the lower limb.*

"Early" radicular pain is a phenomenon that some experienced clinicians believe that they can identify. Their confidence stems from recall of previous patients who presented in a particular way and who subsequently proved to have radicular pain. Unfortunately, this wisdom has not been formally documented in a valid manner. Putative cues include stabbing pain that seems to extend into the buttock but not yet into the entire length of the lower limb. Physicians seeking to make this diagnosis should recognise its lack of validity and reliability. At most they should record their diagnosis as a suspected diagnosis, and one that requires monitoring and possible revision, when further evidence is to hand.

Contentious is the interpretation of a painful, linear, tight band in the posterior thigh. On the one hand the linear disposition of this pain resembles that of radicular pain, and it may be tempting to diagnose such pain as radicular. However, the same sensation can arise as a referred pain. This phenomenon should be interpreted with caution, and not regarded as definitely radicular in origin.

Quality

Somatic pain is characteristically perceived as a deep, dull ache, or pressure-like in quality [9]. It spreads into the lower limb as if the muscle or bones are expanding. When established it may have a gnawing quality.

In contrast, radicular pain is shooting or lancinating in quality [9]. It may be perceived deeply but usually also with a superficial or cutaneous component. The latter is brought into greater relief if the patient also has neurological symptoms and signs.

Difficult to interpret may be the description of burning pain, which is often a feature of neurogenic pain, (i.e. pain resulting from a disease or injury to a nerve, as opposed to pain from musculoskeletal tissues). Some patients with deep pain may use this adjective. Care should be taken to determine if they do, indeed, literally mean burning, or if they are using this word as the best that they can think of to describe a severely irritating pain. Deep, burning pain, in the absence of any other feature, distribution or quality, is not necessarily neurogenic pain. At best, the nature of this pain is indeterminate. On the other hand, burning sensations in the skin strongly implicate a neurogenic mechanism, that may be radicular or some other neurogenic process.

Severity

The severity of back pain carries little diagnostic weight. Patients may describe their pain as severe, but that does not necessarily implicate a serious or threatening condition. There are no valid guidelines by which to assess the clinical significance of reportedly very severe pain. At most, severity should be considered as one parameter in the context of other features, notably Associated Features (see below), in influencing management.

What is helpful is to record the severity of the pain, at baseline and subsequently, using a quantitative measure such as a visual analog scale [10,11,12]. This provides a measure of whether or not the pain improves, that is more reliable than the patient or practitioner's memory of the severity over time.

Frequency

Back pain may wax and wane in severity, but does not exhibit periodicity that is of diagnostic significance. Frequency is more likely to be a function of aggravating factors than an index of the cause or mechanism of pain. The record, however, should at least, show how often the patient suffers pain.

Duration

Other than with respect to length of illness, (see above), the duration of back pain carries no diagnostic significance. At best, episodes of limited duration imply a lesser problem in terms of disability, but not necessarily lesser pathology.

Time of Onset

No particular cause of low back pain has a characteristic time of onset. Morning stiffness is said to be a feature of ankylosing spondylitis, but while this feature has a high to moderate sensitivity, its specificity is moderate to low, and its positive likelihood ratio is only 1.5 [13] or 1.6 [14].

On the other hand, alarming, but not diagnostic, is pain that persists at night or wakes the patient from sleep. Under those circumstances, a red flag condition should be considered (see below).

Mode of Onset

Most cases of low back pain will be spontaneous in onset or related to some perceived injury, such as twisting or lifting. Neither of these modes of onset is contributory in a diagnostic sense.

Alarming should be spontaneous pain of an explosive onset. The validity of this feature has not been studied, but should raise concerns on the basis of traditional, clinical wisdom. It may be the first cue of a spontaneous fracture, or an infection.

Precipitating Factors

A patient who has pain-free intervals might identify activities that can bring on their pain. However, there are no data to substantiate a relationship between particular precipitating factors and particular causes of back pain. At best, a record of precipitating factors provides only a description of the patient and their problem.

Aggravating Factors

Particular movements or activities will commonly aggravate back pain. These carry no diagnostic significance. Virtually any cause of low back pain is likely to be aggravated by movement and activities of daily living.

At best, listing aggravating factors provides a description of the patient and their problem, and foreshadows the assessment of disability. What will be difficult to distil is the extent to which aggravation is due to an actual increase in painful sensations from the back or to fear of aggravation and resultant avoidance of activity (see Chapter 10).

Perhaps more significant is the absence of aggravating factors. A patient with back pain that is not aggravated by spinal movement warrants assessment for a cause of pain that refers pain to the spine. Abdominal aortic aneurysms can present in this way, and misrepresentation of the back pain as musculoskeletal has been recorded one of the reasons for delay in diagnosis of dissecting aneurysm[15].

Relieving Factors

Patients might identify factors that relieve their pain. These could include medications and quasi-therapeutic interventions such as ice packs or hot baths, but also may include certain postures or activities. Although worthwhile as a record of the patient's description of their problem, these factors carry no valid diagnostic significance. It is virtually expectable that patients with a painful joint will feel better in postures that do not load that joint, e.g. lying down.

However, vexatious in this regard is the interpretation of unrelenting back pain: pain that is not relieved by rest, and which is constantly causing the patient anguish. Although this could be interpreted as lack of tolerance by the patient, it could also be a sign of a severe and serious disorder. There are no validated guidelines for the interpretation of this feature. On the one hand, the physician risks over-investigating every patient who claims to be distressed by their pain. On the other hand, they risk missing a serious condition. In the absence of guiding data, this judgement must be taken intuitively; but a critical contribution can be made by associated features. Associated features suggestive of a serious disorder are more reliable than persistence of pain.

Associated Features

Associated features offer the most fruitful realm of interrogation of a patient with back pain. It is in this context that systemic and visceral disorders are most likely to be distinguished from spinal pain of unknown origin. Exploration of associated features can be intercalated, for convenience, with a systems review and a general medical history.

GENERAL	A fever, or a history of sweats or night sweats, requires consideration of osteomyelitis, discitis and epidural abscess; as does a history of recent surgical procedures, catheterisation, and venipuncture. Occupational exposure or recent travel may offer a clue to exotic infections, such as hydatid disease. Weight loss and a history of cancer are important cues of neoplastic disorders presenting with spinal pain (see below).
SKIN	Cutaneous infections may be the source of spinal infection. Psoriatic and similar rashes offer a cue towards the seronegative spondylarthropathies.
GASTROINTENSTINAL	Symptoms or a history of diarrhoea may be a cue towards the seronegative spondylarthropathies.
CARDIVASCULAR	A history of vascular disease or the presence of cardiovascular risk factors warrants assessment for aortic aneurism.
RESPIRATORY	A history of cough may warrant consideration of lung cancer as a risk factor for spinal metastases.
URINARY	Features or a history of urinary tract infection or haematuria warrant an assessment of the renal tract as a source of referred pain to the spine. Urinary retention or poor stream warrants assessment for prostate cancer.
REPRODUCTIVE	Back pain associated with menstrual periods, with abnormal uterine bleeding, or abnormal menstruation warrants gynaecological assessment.
HAEMOPOIETIC	Haematopoietic disorders related to back pain are unlikely to be evident on history, but myeloma is an important consideration for back pain in the elderly.
ENDOCRINE	Endocrine disorders that erode or stretch bone may present with spinal pain, but offer few, if any clues on history alone. Hyperparathyroidism and Paget's disease should be recalled as possible occult causes of spinal pain. Risk factors for osteoporosis such as age and corticosteroid use warrant a consideration of pathological fracture.
MUSCULOSKELETAL	Pain elsewhere warrants consideration of systemic rheumatic diseases.
NEUROLOGICAL	Neurological symptoms are not indicative of any particular cause of spinal pain. They are features that should be assessed and investigated in their own right, quite apart from any complaint of spinal pain.

Circumstances of Onset

Given a patient who ascribes the onset of their back pain to an injury, it is worthwhile to record the circumstances of injury both for descriptive and for medico-legal purposes. It is tempting, further, to infer what the possible, if not likely, nature of the injury is, in pathological terms, given the circumstances of injury. This, however, is a specious exercise.

As a clinically applicable science, biomechanics is still in its infancy concerning back injuries. Essentially, similar external circumstances could produce any number of different injuries to the vertebral column. There is no unique or dependable relationship between external circumstances and internal responses. At worst, such an exercise constitutes diagnosis by imagination. It may be attractive for a practitioner to imagine what happened inside the patient's back during the precipitating episode that they describe, but there is no proven validity to this exercise. A physician's imagination may be limited to what they have been taught, which is not necessarily that which has happened in a patient, or everything that could happen. However, although diagnosis by imagination is neither reliable nor valid, certain general inferences can be drawn from the circumstances of injury, given certain epidemiological and biomechanical data.

It has been shown that twisting in a flexed position, moving external loads of greater than 11.5 kg, constitutes a risk factor for back pain [16]. Furthermore, it has been shown that under torsion, a variety of lesions can occur in the lumbar spine [17]. These range from tears of the anulus fibrosis, through tears of the zygapophysial joint capsules, to impaction and avulsion fractures of the articular processes, and fractures of the pars interarticularis. Coupling these data provides a basis for suspecting that a patient with a history of twisting injury may well have suffered a torsion injury; but what that injury is, in specific anatomical terms, cannot be inferred with validity.

Similarly, biomechanical studies have shown that sudden axial loading, as in a fall into a seated position, or repetitive compression loading, as in repeated lifting, can cause acute or fatigue failure, respectively, of the vertebral endplates, resulting ultimately in internal disc disruption [17]. Given a history of lifting under load, one might conceive that the patient possibly has a compression injury, but the specific nature of that injury cannot be inferred validly from the history alone.

At best, imagining a possible diagnosis on the basis of circumstances of onset might raise a diagnostic hypothesis that is worthy of pursuing, but whether or not that diagnosis should be pursued needs to be considered in context. Whereas it might be legitimate and useful to pursue such a diagnosis in a patient with chronic pain that has defied diagnosis, it is not practical to do so for a patient with acute low back pain. The investigations required to confirm a compression injury or a torsion injury, such as discography and anulography, are invasive and uncomfortable. In a patient with acute back pain, the pre-test likelihood of such conditions are unknown and are arguably low. The natural history of acute low back pain favours relying on passage of time instead of invasive investigations (Chapter 5). There is no point subjecting to investigation patients who are destined to recover anyway in a matter of days or weeks. In the meantime, failure to institute investigations for subtle injuries will not greatly affect immediate management. Under these conditions, any biomechanical formulation about the patient, is best reserved as a plausible hypothesis, perhaps worthy of pursuit once and only if the patient's pain persists despite other immediate and short-term measures.

One possible exception relates to pars interarticularis fractures in sports people. Pars fractures are common in sports people, and the imperative is to identify individuals who have stressed pars that has not yet fractured in order that preservative therapy can be instituted. For that reason there is justification in considering stress of the pars interarticularis in sports people who present with acute low back pain.

Red Flag Conditions

Of paramount concern in the assessment of a patient with low back pain is the detection or exclusion of red flag conditions, such as fractures, infections, or tumours. In the past this has led some practitioners to investigate patients intensely, just in case, or just to be safe. Such actions are not justified. Not only are red flag conditions uncommon, a meticulous history and physical examination can adequately screen them. Moreover, many of the commonly used tests, e.g. X-ray and ESR, lack sensitivity and specificity, and may be false negative. A negative result, therefore, may create a false sense of security.

Fortunately, many of the practices used to detect red flag conditions have been subjected to scientific scrutiny, and data on their validity are available. These are reviewed systematically below.

General Remarks

The literature, clinical experience and formal research has shown that

1. the red flag conditions are mercifully rare; therefore, the pre-test odds are in favour of the condition not being present, which should be reassuring both to the patient and to the practitioner.
2. cases of red flag conditions are typically suspected, not on the basis of results of special investigations, but on the basis of history or examination.
3. when serious conditions have been missed it is not for lack of special investigations but for lack of adequate and thorough attention to clues in the history.
4. certain conditions will be missed even with special investigations, because the condition is early in its evolution and defies resolution.
5. missing certain conditions makes no difference to the outcome, because nothing could have been done to avert the progress of the condition in any case.

Once a red-flag condition has been identified or strongly implicated, conventional algorithms should be implemented for the confirmation and management of that condition.

Fractures

With respect to fractures, the cardinal indicators are trauma and age (Table 7.3). In the general population, significant fractures, presenting as back pain, occur only in patients with a history of major trauma [18]. Minor trauma is not a risk factor for fractures unless the patient has osteoporosis. In this regard, the patient's age (> 50) is the cardinal guideline although the literature suggests that patients with osteoporotic fractures following minor trauma tend to be substantially older than this limit [18]. Consumption of corticosteroids is another risk factor for osteoporosis.

Major trauma
Minor trauma associated with Osteoporosis
Age > 50
Use of Corticosteroids

Table 7.3. *Risk factors and indicators for fractures of the lumbar spine.*

Cancer

The pre-test probability of a patient in general practice who presents with back pain having cancer as the cause is less than 0.7% [19]. The majority of patients who prove to have cancer as the cause of their back pain are elderly [19].

If age > 50, p = 0.56%

< 50, p = 0.14%

Of the various clinical features that have been formally tested (Table 7.4), relief of pain by bed rest is a relative negative predictor of cancer. Features which, individually, raise the suspicion of cancer are weight loss, age, past history of cancer, failure to improve with therapy and prolonged pain. A past history of cancer is by far the single strongest indicator. Note that because "failure to improve", and "prolonged pain" are indicators, the diagnosis of cancer is unlikely to be made on the first visit, unless other indicators obtain.

CATEGORY OF ENQUIRY	RESPONSE	SENS	SPEC	+LR	-LR	Ref
Length of illness	Longer than 1 month	0.50	0.81	2.6	1.6	19
Relieving features	Not relieved by bed rest	1.00.	0.46	1.9	_	19
Spinal Tenderness	Primary care patients	0.15	0.60	0.4	0.7	19
	Hospital patients	0.60 0.80	0.70 0.78	2.0 3.6	1.8 3.9	20 20
Weight	Weight loss	0.15	0.94	2.5	1.1	19
Age	≥ 50	0.77	0.71	2.7	2.4	19
Past History of Illness **Respiratory** **Urinary** **Breast**	 Lung Cancer Prostate Cancer Breast Cancer	 0.31	 0.98	 15.5	 1.4	 19
Treatment	Failure to improve	0.31	0.90	3.1	1.3	19
Haematocrit	<30%	0.09	0.994	15	1.1	19
ESR	> 20mm/hr >50mm/hr >100mm/hr	0.78 0.56 0.22	0.67 0.97 0.99	2.4 15.3 55.0	3.0 2.2 1.3	 19 19
SnNout	< 50 No past history of illness No weight Loss No failure to Improve	1.00				21

Table 7.4. *Statistical data on the validity of clinical features for the diagnosis of cancer of the lumbar spine. SENS: sensitivity. SPEC: Specificity. +LR: positive likelihood ratio. -LR: negative likelihood ratio. Ref: references. SnNout: high sensitivity - negative rules out.*

The strongest negative predictors are age less than 50, no past history of cancer, no weight loss, and no failure to improve with therapy (Table 7.4). Patients with this combination of features are extremely unlikely to have cancer as the basis of their back pain.

Infection

The pre-test probability in general practice of a patient who presents with back pain having an infection as the cause of their pain is said to be less than 0.01% [21]. This figure, however, is not derived from population studies. The literature cited by the source [21] derives the figure from personal communications provided to the authors of a cost-effectiveness study of radiographs for low back pain [22]. The figure, therefore, may not be valid. Its order of magnitude, however, indicates nevertheless that spinal infections are a rare cause of acute low back pain.

The cardinal indicator for infection is fever; the cardinal risk factor is the answer to the question - "why should or why could this patient have an infection?" The specific risk factors are penetration of the body by needles, catheters or other instruments, which includes surgical procedures. Statistical data on the validity of clinical signs as indicators of infection being the cause of low back pain are provided in Table 7.5.

ENQUIRY	FEATURE	SENS	SPEC	+LR	-LR	Ref
Associated features						
Tenderness		0.86	0.60	2.2	4.3	21
Fever	TB	0.27	0.98	13.5	1.3	21*
	Pyogenic	0.50	0.98	25.0	2.0	21*
	Epidural Abscess	0.83	0.98	41.5	5.8	21*
	Epidural Abscess	0.32				23
ESR	Elevated	0.92				24
WCC	>10,000	0.42				24
Personal Profile						
Occupation	? farmer - hydatid					
Prescription drugs	? steroids					
Illicit drugs	IV use					24,25
Past History of Illness						
Infections	Skin	0.40				21,26,27
Procedures	IV catheters	0.40				24,26
Urinary	UTI of catheter	0.40				24,27
*****: Although these are the figures provided in the publication cited, it is difficult to determine from that publication from where and how those figures were derived. The sources cited are either wrong, or do not contain the figures cited. Accordingly these figures may not be accurate.						
Confirmation of an infection would be by way of an FBC and ESR and culture of fluids in the first instance. Imaging would be undertaken only if there were indicative signs of infection. A bone scan is the primary investigation for suspected infection.						

Table 7.5. *Statistical data on the validity of clinical features for the diagnosis of infection of the lumbar spine. SENS: sensitivity. SPEC: Specificity. +LR: positive likelihood ratio. -LR: negative likelihood ratio. Ref: references.*

Ankylosing Spondylitis

The pre-test probability in general practice of a patient who presents with back pain having ankylosing spondylitis (AS) as the cause of their pain is of the order of 0.3% [21] to 0.9% [14].

This condition is virtually impossible to diagnosis early in its evolution, and failure to do so makes no significant difference to its management. The final diagnosis relies on a combination of family history, associated features, and progression of the disease both in extent and in severity.

The earliest warning hallmarks are morning stiffness, a slow onset at an age less than 30, and improvement with exercise (Table 7.6). These raise the suspicion of AS but alone are not diagnostic. The chances of radiographic changes establishing the diagnosis early in the illness are virtually nil because of the insensitivity of plain films to early changes and the poor reliability of readers to grade early changes of AS.

The HLA B27 serum test is of no diagnostic value because the presence of this antigen in the asymptomatic population is between 50 and 200 times greater than the prevalence of the disease [28].

Table 7.6 is not designed as a guide for the positive diagnosis of AS. Rather, it serves to highlight warning signs that alert the physician to consider AS instead of lumbar spinal pain of unknown origin. The likelihood ratios are small and are insufficient to make an affirmative diagnosis of a disease that is so rare. Indeed, even the "4 out of 5 criteria" results in high false positive rates [29]. For a more comprehensive discussion of how to establish a diagnosis of AS see Gran [14].

CATEGORY OF ENQUIRY	FEATURE	SENS	SPEC	+LR	-LR	Ref
Length of Illness	Age of onset ≤ 35 Age of onset ≤ 40 Duration > 3 months	0.92 1.00 0.71	0.30 0.07 0.54	1.3 1.1 1.5	3.8 - 1.9	14,20, 14,21 14,21
Relieving Features	Not relieved by bed rest	0.80	0.49	1.6	2.5	14,21
Associated features **Morning Stiffness**	> 30 min	0.64	0.59	1.6	1.6	14,21
Chest Expansion	< 2.5 cm	0.09	0.99	9.0	1.1	14,21
ESR		0.69	0.68	2.2	2.2	20
4 out of 5 of	morning stiffness improved with exercise onset < 40 slow onset duration > 3 months	0.95	0.85	6.3	17.0	21,27
Sacroiliac joint signs are not diagnostic or indicative of AS. Diagnostic would be the onset of ocular, cardiac, GIT signs and appendicular involvement. The diagnosis is clinical and does not require or invite an HLAB27						

Table 7.6. *Statistical data on the validity of clinical features for the diagnosis of ankylosing spondylitis of the lumbar spine. SENS: sensitivity. SPEC: Specificity. +LR: positive likelihood ratio. -LR: negative likelihood ratio. Ref: references.*

Checklist

These various data and recommendations can be used to construct a convenient checklist (Table 7.6). The checklist can be adapted into a form suitable for use by practitioners, such that it can be incorporated into any medical record. A positive response to any entry in the checklist does not necessarily implicate the presence of a red flag condition. Rather, it serves only to alert the practitioner to the possibility of a red flag condition, and calls for greater attention to the feature. On the other hand, if all items are checked and all responses are negative, the practitioner can be assured that the possibility of a red flag condition is extremely unlikely, and that further investigation for red flag conditions is not indicated.

Name:_____ D.O.B _____			**Low Back Pain** M.R.N._____					
Presence of			**Cardiovascular**			**Endocrine**		
Trauma	Y	N	Risk factors?	Y	N	Corticosteroids?	Y	N
Night Sweats	Y	N	Respiratory			**Musculoskeletal**		
Recent Surgery	Y	N	Cough?	Y	N	Pain elsewhere?	Y	N
Catheterisation	Y	N	**Urinary**			**Neurological**		
Venipuncture	Y	N	UTI?	Y	N	Symptoms/signs	Y	N
Occupational exposure	Y	N	Haematuria?	Y	N	**Skin**		
Hobby exposure	Y	N	Retention?	Y	N	Infections?	Y	N
Sporting exposure	Y	N	Stream problems?	Y	N	Rashes?	Y	N
(Overseas) travel	Y	N	**Reproductive**			**G.I.T.**		
Illicit drug use	Y	N	Menstrual problems?	Y	N	Diarrhoea?	Y	N
Weight loss	Y	N	**Haematopoietic**			**Signature:**		
History of cancer	Y	N	Problems?	Y	N			
Comments								
© National Musculoskeletal Medicine Initiative 1999						**Date:**		

Table 7.7. *A checklist for red flag clinical indicators, suitable for inclusion in medical records used in General Practice, developed by the National Musculoskeletal Medicine Initiative.*

Excluding red flag conditions in this manner does not guarantee that a red flag condition is absolutely not present. It establishes only that, for the present, further investigation is not warranted. Sinister conditions may not be evident early in the history of a patient, but they could manifest in due course. For that reason the red flag checklist is only a temporising measure. It does not excuse the practitioner from continuing vigilance. For that purpose the red flag checklist can be re-administered whenever the patient is again seen, in order not only to maintain, but also to record vigilance.

Investigations

If a red flag condition is suspected, appropriate further investigations should be undertaken. Recommended investigations are shown in Table 7.8. In this regard, the investigations listed are not ones indicated for the investigation of back pain; nor should they be construed as screening tests for patients with back pain. They are tests explicitly indicated only if the patient's history suggests the corresponding red flag condition.

Since these tests are not designed for the investigation of back pain, *per se*, their validity and utility are not considered under the terms of the present Guidelines. Rather, they constitute part of the general armamentarium of medical practice, and their validity and use is either assumed or subject to other Guidelines.

In Table 7.8, imaging is prescribed rather than X-ray, on the grounds that plain radiographs may not be the

appropriate investigation for certain conditions. For screening purposes it may be more appropriate to use bone scan because of its greater sensitivity; and MRI may be a far more specific test than plain radiography.

CONDITION		INVESTIGATIONS
TUMOURS		
PRIMARY (rare; 0.04% of all tumours)	myeloma	IEPG, imaging, biopsy
	tumours of bone	imaging
	tumours of cartilage	imaging
SECONDARY	prostate	serum calcium, alkaline phosphatase acid phosphatase, prostate specific antigen, imaging
	breast lung thyroid kidney GIT melanoma	imaging
INFECTION	osteomyelitis epidural abscess	FBC,ESR
METABOLIC BONE DISEASE	Paget's disease Hyperparathyroidism	serum calcium alkaline phosphatase acid phosphatase Bone Scan
VISCERAL DISEASE	aortic aneurysm	abdominal exam, ultrasound
	retroperitoneal disease	abdominal exam, ultrasound
	pelvic disease	pelvic examination, rectal examination

Table 7.8. *The cardinal Red Flag conditions and the appropriate investigations for their confirmation.*

An explicit protocol has been advocated for the investigation of patients in whom cancer is suspected [19]. It recommends that:

> Patients with a **past history of cancer** should be considered **"high risk"**. In these patients an immediate ESR and imaging is warranted and a positive result on either tests mandates further work-up. (Deyo and Diehl[16] stipulated "x-ray" rather than imaging; but it may be more appropriate to use more sensitive or more specific imaging modalities according to the nature of the cancer suspected.)
>
> Patients under the age of 50, with no history of cancer, no weight loess, no signs of systemic illness, and who do not fail to improve, are considered **"low risk"**. For these patients no laboratory tests or imaging are warranted.
>
> Patients **over 50**, or those who **fail to respond** to treatment, or who have unexplained **weight loss** or signs of **systemic illness** constitute "intermediate risk" risk. For these patients, an ESR is appropriate. If the ESR is < 20 mm/hr, no further investigation is warranted. If the ESR is > 20 mm/hr, imaging should be undertaken. If the imaging is normal, these patients should be closely monitored.

This protocol secures the detection of cancer without gratuitous use of unnecessary imaging.

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Chapter 8. Physical Examination

Traditional wisdom and conventional practice dictate that, in a patient with lumbar spinal pain, the lumbar spine should be inspected palpated and moved. In some circles even passive, intervertebral motion is tested. However, although this process may serve to *provide a description* of the patient, the existing evidence-base shows that no particular clinical sign, or combination of signs, found by this process, allows a valid or reliable diagnosis to be made in anatomical or pathological terms.

Inspection

Inspection may reveal minor aberrations of shape or posture of the lumbar spine, such as a loss of lordosis or a list. In some studies, the reliability of detecting gross examples of such aberrations has been found to be good, with kappa scores of the order of 0.5 to 0.7[1], but in other studies agreement is worse[2] (Table 8.1). Notwithstanding agreement, there are no data to show that such features have any construct validity for diagnosis or any predictive validity concerning treatment.

TEST		Kappa	Source
Inspection			
lordosis		0.50 to 0.70	1
lordosis (PT)		-	2
lordosis (MD)		0.32	2
list (PT)		0.39	2
list (MD)		0.13	2
asymmetries		0.34 to 0.84	3
Palpation			
tenderness			
	anywhere	1.0	1
	at specific sites	0.11 to 0.38	1,4
	paravertebral (PT)	0.27	2
	paravertebral (MD)	0.22	2
	intersegmental	0.40 to 0.78	3
	intersegmental L5-S1 (PT)	0.55	2
	intersegmental L5-S1 (MD)	0.40	2
	intersegmental L4-5 (PT)	0.56	2
	intersegmental L4-5 (MD)	0.40	2
	spinous process	0.55 to 0.90	3
	iliac crest	0.66	5
	trigger points	< 0.40	6,7

Table 8.1. *The reliability of inspection and palpation in the examination of the lumbar spine. PT: physical therapists. MD: medical practitioners.*

Identifying major postural deformities such as scoliosis is important for the diagnosis of such deformities in their own right, but it has no bearing on making a diagnosis of the cause of back pain. There is no direct relationship between major deformity and any known source or cause of lumbar spinal pain.

Similarly, identifying pigmentation, dimples, or patches of hair at the base of the spine is of significance for the recognition of congenital defects of the spine and spinal cord, but it has no direct bearing on the diagnosis of back pain.

A critical, but sometimes overlooked component of inspection is to determine whether or not the patient has back pain. Formal studies have shown that two observers readily disagree on this question [4]. In order to conform to the definitions of the IASP [9], the patient should indicate that the pain appears to arise in the region bounded laterally by the lateral borders of the erector spinae, or a vertical line through the posterior superior iliac spine if the pain centres over the sacral region. Pain over the buttock should not be confused with or misrepresented as spinal pain or back pain. Although pain in the buttock might referred to that location from a lumbar spinal source, if buttock pain is the primary complaint it should be assessed in that context. It could indicate a local source of pain in the buttock muscles or indicate a hip problem. In either case it is not equivalent to or synonymous with back pain. Such attention to taxonomy may prevent patients with buttock pain from undergoing unnecessary and futile investigations of their lumbar spine.

Palpation

Palpation can be used to identify hyperaesthesia of the site over the back. In some studies this has been found to be a common feature amongst patients with back pain [10]; but this feature is non-specific, for it offers no insight as to the cause or source of pain.

Identifying numbness or hyperaesthesia over the buttocks may draw attention to entrapment neuropathies of the superior clunial nerves in patients with thoracolumbar pain [11].

Otherwise, the cardinal application of palpation has traditionally been to identify tenderness, i.e. a point or points which when pressed reproduce the patient's pain. This pursuit, however, in confounded both by lack of reliability and lack of validity.

Studies have shown that two observers can agree on finding tenderness somewhere in the lumbar spine in patients with back pain, with kappa scores equal to 1.00 [1], but when the location of tenderness is specified, agreement falls and varies from site to site (Table 8.1). Agreement is poor for paravertebral tendemess defined as tenderness anywhere from the midline to the midaxillary line [2]. In one study, agreement about tenderness at specific sites was poor [4]. In others [2,3], agreement on paramedian, intersegmental tenderness was fair to good.

One site where kappa scores for tenderness are good is over the iliac crest superomedial to the posterior superior iliac spine [5]. However, the specificity of tenderness over this site is unknown. Various interpretations have been invoked but none has been validated with respect to the source or cause of pain (Chapter 4). The validity of other sites of tenderness in muscle has not been determined.

Bone tenderness over the lumbar spinous processes has been held to be an alerting sign of osseous disorders such as infection or neoplasm. The reliability of palpation for bony tenderness over the spinous processes has been shown to be good to very good, depending on the segment involved and the examiners. This sign, however, has poor specificity and offers a positive likelihood ratio of only 2.2 for infection [12].

As a diagnosis, "trigger point syndrome" lacks validity for there is no objective criterion standard for the entity or its purported pathology. Moreover, in the lumbar spine, the detection of trigger points in the erector spinae or quadratus lumborum has poor reliability, with kappa scores less than 0.4 [6,7]. If the diagnostic criteria for a trigger point are relaxed to consist only of tenderness, the kappa scores increase [7], but this increase in reliability is at the expense of validity of the diagnosis, for tenderness alone does not constitute a diagnosis of a trigger point syndrome, or any other condition; it is simply tenderness.

The entity of "muscle spasm" has no validity for there is no known neurophysiological correlate of this clinical sign [13,14]. Moreover, in formal studies, the reliability of finding muscle spasm has been so poor as to defy reporting in terms of kappa scores [1].

Range of Motion

Gross limitations of range of motion of the lumbar spine can be reliably detected by inspection, although the kappa scores for limited flexion are better than for limited lateral flexion (Table 8.2). Agreement is good on whether movement aggravates pain or not (Table 8.2). Using a goniometer ostensibly offers greater precision in measuring range of motion, but the probability of an inter-examiner difference of 5^o is 0.59; the probability of a difference of 10^o is 0.28; and the probability of a 15^o difference is as high as 0.11 [15]. Consequently, inter-examiner variation erodes any precision in measurement offered by a goniometer.

Regardless of agreement or otherwise, range of motion offers no diagnostic insight. Limited range of motion is a non-specific feature that can be expected as a result of any form of low back pain. There is no evidence that any particular pattern of limitation of movement implicates a particular cause or source of back pain.

TEST		**Kappa**	**Source**
Motion			
gross range			
	lateral (PT)	0.43	2
	lateral (MD)	0.11	2
	lateral	0.41	1
	extension (PT)	0.74	2
	extension (MD)	0.35	2
	flexion	0.81	1
pain on	lateral flexion (PT)	0.51	
	lateral flexion (MD)	0.06	2
	extension (PT)	0.76	2
	extension (MD)	0.71	2
	flexion (PT)	0.63	2
	flexion (MD)	0.71	2
mobility	L5-S1 (PT)	0.54	2
	L5-S1 (MD)	- 0.08	2
	L4-5 (PT)	0.75	2
	L4-5 (MD)	-	2
PPIVM	flexion	- 0.11 to 0.32	8
	extension	- 0.02 to 0.23	8
PAIVM	transverse	- 0.15 to 0.23	8
	central	- 0.14 to 0.24	8
	unilateral	- 0.10 to 0.11	8

Table 8.2. *The reliability of selected tests of motion used in the examination of the lumbar spine. PT: physical therapists. MD: medical practitioners. PPIVM: passive physiological intervertebral motion. PAIVM: passive accessory intervertebral motion.*

Guarded movements carry no specificity. Putatively they might occur as a result of any cause of back pain. Moreover, the reliability of detecting guarded movements is very poor [1].

Intervertebral Motion

Manual therapists contend that they can identify symptomatic lumbar spinal segments by careful examination of intersegmental motion. For the lumbar spine, the validity of this contention is elusive. One study [8] claimed a good correlation between the findings on manual examination and the results of diagnostic spinal blocks, but the nature of the blocks or their results were not described. Furthermore, the reliability of examination was poor, with kappa scores ranging from 'minus' 0.15 to only 0.32[8].

Other studies have indicated that physiotherapists are able to agree as to whether an L5-S1 or an L4-5 segment is hypomobile, but that doctors are unable to agree on this feature [2] (Table 8.2). However, when estimates of intersegmental stiffness are compared, agreement is poor [16].

McKenzie

The McKenzie school of spinal assessment maintains that discogenic pain can be diagnosed on the basis of whether or not the patient's pain "centralises" upon certain movements of the lumbar spine, i.e. the extent of radiation of pain into the lower limb retracts [17]. The reliability of McKenzie examination differs amongst observers. Some have found poor reliability [18] but others have found good reliability [17] and have argued that expert training is critical.

The validity of McKenzie examination has been tested against discography as a criterion standard, and the correlation between findings is statistically significant, but as a diagnostic test McKenzie examination is only marginally effective. It offers only modest likelihood ratios [19] (Table 8.3).

	Discogenic Pain with Competent Anulus				
	Yes	**No**	**Sens**	**Spec**	**LR**
Centralizers	21	10	0.72	0.70	2.4
All others	8	24			
Centralizers	21	10	0.78	0.50	1.6
Peripheralizers	6	10			
Change +/-	27	20	0.93	0.41	1.6
No change	2	14			

Table 8.3. *Contingency table for the validity of McKenzie tests in the diagnosis of discogenic pain and painful lumbar disc with a competent anulus. Based on the data of Donelson et al[13]. Sens: sensitivity. Spec: specificity. LR: likelihood ratio.*

Sacroiliac Joint

The sacroiliac joint has been promoted as an important, if not common, source of back pain, and a number of physical tests have been developed to diagnose so-called sacroiliac dysfunction. Those tests considered by an international panel of experts to be the most useful have been subjected to scientific scrutiny. It transpires that these tests are highly reliable, with kappa scores of the order of 0.8[20], but as indicators of pain stemming from the sacroiliac joint, they lack validity, with positive likelihood ratios barely greater than 1.0, and less than 1.0 in some instances [20]. Furthermore, they are positive in some 25% of individuals who have no pain [21].

Normal Findings

Although physical examination of the lumbar spine may lack reliability or validity when a positive diagnosis is being pursued, there is at least concept validity for the opposite. It should be strange to find no abnormalities on palpation and movement of a patient presenting with lumbar spinal pain. Such a finding should alert the examiner to reconsider referred pain to the lumbar spine from visceral disorders or a red flag condition. Arguably, this possibility is the singular most important reason for examining the lumbar spine. Finding positive features on examination does not lead to a valid, particular musculoskeletal diagnosis but finding no abnormalities is conspicuous and should be alerting.

Neurological Examination

Perhaps the most difficult concept to explain in spine medicine is the lack of relevance of neurological examination in a patient with back pain. The tradition and habit of performing a neurological examination stems from an era when its believed that disc prolapse was the cardinal, if not the only legitimate, cause of common back pain. Because disc prolapse caused radiculopathy a neurological examination was mandatory, but the misconception arose that, therefore, a neurological examination was mandatory for all patients with back pain. This line of reasoning is false on epidemiological, clinical and neurophysiological grounds.

> Disc prolapse accounts for fewer than 5% [22,23] or 12% [24] of lumbar spine presentations. Therefore, the majority of patients do not present with disc prolapse and, therefore, would not be expected to exhibit neurological signs of disc prolapse.
>
> If disc prolapse causes pain, it is radicular pain, which is felt not in the back but in the lower limb. Therefore, although a patient presenting with lower limb pain might warrant a neurological examination, a patient presenting with back pain, by definition, does not have radicular pain, and does not warrant a neurological examination as does a patient with radicular pain.
>
> Neurological signs are produced by conduction block in motor or sensory nerves, but conduction block does not cause pain. Thus, even in a patient with back pain and neurological signs, whatever causes the neurological signs is not causing the back pain by the same mechanism. Therefore, finding the cause of the neurological signs does not implicitly identify the cause of pain. Conditions such as radiculitis may cause both pain and neurological signs, but in that event the pain occurs in the lower limb, not in the back. If root inflammation also happens to involve the nerve root sleeve, back pain might also arise, but in that event the patient will have three problems each with a different mechanism: neurological signs due to conduction block, radicular pain due to nerve-root inflammation, and back pain due to inflammation of the dura.

Given these arguments it is informative to consider the place of neurological examination in each of five contexts.

1. The patient with back pain only

In patients with back pain only, and who upon enquiry deny neurological symptoms, there is no reason axiomatically to suspect a neurological disorder and, therefore, no indication for a neurological examination.

2. The patient with somatic referred pain

In patients with back pain and somatic referred pain in the lower limb, particularly if it is focused over the buttock and thigh, there is no reason, prima facie, to suspect a neurological condition or to expect neurological signs. However, if the physician is not certain that the patient's pain is in indeed somatic and referred, and the possibility obtains that the pain is radicular, that patient should be considered under the following category.

3. The patient with radicular pain

Patients with radicular pain warrant a neurological examination, but in this context it should be clear that the presenting feature that attracts a neurological examination is not back pain but the radicular pain. Radicular pain invites an assessment parallel but separate to the assessment of back pain for, although in some patients the one condition may cause both symptoms, in others the causes may be different, if not remote, from one another.

4. The patient with neurological symptoms

If patients volunteer or acknowledge neurological symptoms, a neurological examination is mandatory, but in that event the patient is not presenting with back pain but with a neurological disorder.

5. Insecurity

It may transpire that out of habit, out of respect for traditional practice, or because of uncertainty, a physician feels compelled to perform a neurological examination in patients presenting with back pain. In that event, unless the patient acknowledges neurological symptoms, a screening examination should suffice.

> Having the patient walk on their heels and on their toes can rapidly assess integrity of the L5 and S1 myotomes. Integrity of the sensory roots of L1 to S2 can be assessed by touch in the centres of the respective dermatomes. In this context, studies have shown that neurological examination in patients with and without radiculopathy is quite reliable, with kappa scores in excess of 0.6[1,4]. Testing reflexes is superfluous if there are no motor or sensory abnormalities in a patient who otherwise complains of no neurological symptoms.

If no neurological abnormalities are found on screening examination, the pursuit of neurological signs can be terminated and the physical examination reverted to the assessment of back pain. However, if at any time a neurological abnormality is encountered it should be assessed in detail with respect to nature, extent and severity, looking also for convergent associated abnormalities, such as motor signs that correlated with sensory signs. In that event, the patient's neurological disorder should be assessed in parallel with, or even ahead of, their back pain, but in either case, as a separate entity lest a potentially false inference be drawn that the cause of the neurological signs is also the cause of their back pain.

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Chapter 9. Imaging

It has been common, if not traditional, for medical practitioners to request medical imaging as part of their assessment of patients with back pain. Plain radiographs of the lumbar spine are the most commonly requested investigation. The available evidence-base questions the propriety and utility of this practice.

Plain Radiography

The utility of plain radiographs can be considered in terms of the following questions, which should underlie any request for x-ray examination:

What can they show?

What do they show?

Are they reliable?

Are they valid?

What are the hazards?

Lesions Demonstrable

The conditions that plain radiographs might demonstrate in a patient with acute low back pain fall into four categories:

normal	When no abnormality is detected;
abnormal but of no clinical significance	When radiographs reveal abnormalities not related to pain, such as spondylosis, spina bifida occulta, transitional vertebrae, spondylolysis and spondylolisthesis;
abnormal but of questionable clinical significance	when radiographs reveal abnormalities that may or may not be related to pain, and whose detection makes little or no difference to management, e.g. diffuse idiopathic skeletal hyperostosis;
incidental or serendipitous abnormalities	when radiographs reveal conditions that may or may not be related to the patient's pain, but which in their own right warrant treatment, e.g. Paget's disease, osteoporosis;
red flag conditions	osteomyelitis, discitis, paraspinal infections, tumours, fractures.

Yield

The incidence of normal radiographs in patients with acute low back pain ranges from 21% in medical centre settings [1,2], to 38% in emergency departments [3], and 37% [4] or 43% in primary care [5].

Spondylosis or degenerative joint disease accounts for between 26% to 48% of cases [1,2,3,4,5]. Minor congenital abnormalities are found in 5-10% of cases [1], and old fractures in a further 5-10% [1,3]. Spondylolisthesis occurs in 2-5% of cases [1,2,5], and spondylolysis in some 5% [1].

The incidence of osteoporosis is determined by the age of the population surveyed, but ranges from 2-4% [1, 2] to 10% [5] in reported studies.

Incidental and red flag conditions are rare in primary care populations.

Reliability

The reliability of reading various features on plain films ranges from very good to poor [6] (Table 9.1). Good to very good agreement obtains for osteophytes at all levels, and for disc space narrowing and sclerosis at lower lumbar levels. The agreement for facet sclerosis is poor. The latter means that diagnoses of facet sclerosis are inadmissible.

Feature	**Kappa Score**				
	L1-2	**L2-3**	**L3-4**	**L4-5**	**L5-S1**
Narrowing	0.3	0.5	0.6	0.6	0.6
Sclerosis	0.5	0.3	0.6	0.5	0.4
Osteophytes	0.8	0.6	0.5	0.6	0.6
Facet Sclerosis	0.3	0.3	0.3	0.3	0.2
Schmorl's nodes	0.4	0.3	0.5	0.4	0.4

Table 9.1. *Reliability of plain films, based on Coste et al [6].*

Validity

Other than in the context of red flag conditions, plain radiographs lack validity in establishing the source of back pain.

Spondylosis

Spondylosis, disc degeneration, facet degeneration or osteoarthritis are not legitimate diagnoses of the cause or source of back pain. The correlations with pain are either nil or poor. On plain films, spondylosis is equally common in both symptomatic and asymptomatic individuals [7,8,9,10,11] (Table 9.2) and does not, therefore, constitute a diagnosis of the cause of pain.

The study of Torgerson and Dotter [7], indicated a significant positive relationship between symptoms and what they called "disc degeneration", which they defined as "disc narrowing" (Table 9.3). This relationship, however, does not necessarily implicate the affected disc or discs as the source of pain, for later studies have shown that although narrow discs tend more often to be painful; painful discs are not necessarily narrow, nor are all narrow discs necessarily painful [12]. Disc narrowing is an insensitive guide to discogenic pain. Moreover, although the correlation is positive, it is not strong (Table 9.4). The likelihood ratio of only 2.5 limits the confidence of a positive diagnosis in a given case.

Age	Asymptomatic			Symptomatic		
	N	n	%	N	n	%
All	217	102	47%	387	208	57%
40-49	64		22%			34%
50-59			49%			54%
60-69	69		74%			73%

Table 9.2. *The prevalence of spondylosis in asymptomatic individuals and patients with lumbar spinal pain, based on Torgerson and Dotter [7]. Note that the relationship between spondylosis and symptoms is not significant statistically. N: total number of patients surveyed. n: number affected.*

Age	Asymptomatic			Symptomatic		
	N	n	%	N	n	%
All	217	48	22%	387	218	56%
40-49	64	4	6%	146	70	48%
60-69	69	33	48%	78	48	62%

Table 9.3. *The prevalence of disc degeneration in asymptomatic individuals and patients with lumbar spinal pain, based on Torgerson and Dotter [7]. Disc degeneration was defined as narrowing of the central portion of the disc by more than 2mm. N: total number of patients surveyed. n: number affected. The relationship between disc degeneration and symptoms is significant ($P < 0.05$) on a c^2 test.*

Disc Degeneration	Symptomatic	Asymptomatic	Sens	Spec	LR
Present	218	48	0.56	0.77	2.5
Absent	169	169			
	387	217			

Table 9.4. *Validity of so-called disc degeneration as a diagnostic sign of back pain, based on Torgerson and Dotter [7]. Sens: sensitivity. Spec: Specificity. LR: likelihood ratio.*

Congenital Anomalies

Congenital anomalies such as transitional vertebrae, non-dysjunction (congenital fusion), and spina bifida occulta, occur equally commonly in symptomatic and asymptomatic individuals [9,10,13]. Consequently, they cannot be inferred to be the cause of pain.

Spondylolysis

Spondylolysis is the former term for a defect in the pars interarticularis of a vertebra, (typically of L4 or L5), passing obliquely from the superior border to the lateral border of the lamina, filled with fibrous tissue [14]. The defect typically undercuts the capsules of the zygapophysial joints above and below [14]. This means that on arthrography, the defect may appear to communicate with the joint spaces of either or both of these joints [15]. The fibrous tissues filling the defect contains nerve fibres and free nerve endings [16] which contain neuropeptides [17]. Therefore, the defect is, in principle, capable of intrinsically being a source of pain.

The pars is the thinnest part of the vertebra. In many individuals it is endowed with only enough bone to tolerate average activities of daily living [18]. Larger forces will fracture the pars. The pars interarticularis transmits forces from the inferior articular process and spinous process to the pedicle and thence to the vertebral body, and is involved in resisting anterior translation, torsion and flexion of the intervertebral joint [19,20,21]. In flexion, the pars bends forwards, not backwards, ostensibly because of tension on the inferior articular process exerted by the zygapophysial joint capsule [21]. Consequently, the pars is susceptible to fatigue fracture in repeated loading in compression with flexion [19]. It can also be fractured by axial rotation [22].

In 32,600 asymptomatic adults, the prevalence of a pars defect was found to be 7.2% [23]. It has a similar prevalence in symptomatic and asymptomatic adults [24] (Table 9.5).

	Asymptomatic		**Symptomatic**	
Unilateral	26	3%	2	0.3%
Bilateral	65	7%	62	9%
All	91	10%	64	9%
N	936		662	

Table 9.5. *The prevalence of spondylolysis in symptomatic and asymptomatic individuals, based on Libson [24].*

There are no proven risk factors, but anthropological surveys implicate arduous activities involving bending and twisting. Pars defects are particularly prevalent amongst Eskimos but the prevalence is not racially based or genetically based; rather the prevalence differs amongst different tribes whose activities of daily living differ [25]. Pars fractures appear to be more prevalent amongst sports people involved with twisting movements alone or in combination with flexion or extension (Table 9.6).

Category	Prevalence	Ref
Contact sports	>20%	26
Gymnasts	11%	27
Various sports	>20%	28
Football	13%	29
Fast bowlers	50%	30

Table 9.6. *The prevalence of spondylolysis in sports people.*

Previous beliefs that pars defects were due to non-union of two ossification centres in the lamina are not true. Evidence against this belief includes:

- the lamina has only one ossification centre [31]
- pars defects do not occur in infants [31]
- pars defects do not occur in non-ambulatory individuals [32]
- the prevalence increases with age [33]
- the prevalence is related to repeated activities that involve hyperextension, rotation or flexion or a combination of both [33].

The biomechanical and epidemiological evidence points to pars defects being an acquired fracture, either as a result of single severe trauma or as a result of fatigue failure [19,21,32,34,35]. The fibrous tissue that fills the defect may contain osseous debris that is evidence of its traumatic origin [17].

Pain is the only alleged clinical feature, but the relationship may be specious. *Presumably*, pain can arise from either or both of at least two mechanisms:

1. Movement of the lamina may strain the innervated fibrous tissue of the defect.
2. In cases of bilateral pars defects, movement of the flail lamina and spinous process may strain the zygapophysial joint to which the flail segment is still attached.

Pain aggravated by activity is said to be the cardinal clinical feature of pars fracture [32], although this feature alone cannot discriminate spondylolysis from other mechanical causes of back pain. In children, symptoms reportedly occur in only 13% of individuals who exhibit a pars defect, usually at growth spurts [32]. However, it is not evident whether this pain arises from the defect or as a result of the onset or progression of isthmic spondylolisthesis. Tight hamstrings resulting in an abnormal gait are considered to be a clinical feature of pars defects [32], but it is not clear whether this is due to the defect or to the development of isthmic spondylolisthesis.

In the absence of diagnostic clinical features, radiography has been the cardinal means of identifying pars fractures. However, finding a pars defect on a plain film does not constitute establishing a diagnosis of the patient's pain. Because of the high prevalence of this condition in the asymptomatic population, the likelihood ratio of plain radiography is too close to 1.0 to allow the diagnosis to be established on this basis (Table 9.7).

PARS FRACTURE	PAIN	NO PAIN	SENS	SPEC	+LR
Unilateral **None**	2 660	26 910	0.03	0.97	1.08
Bilateral **None**	62 600	65 871	0.09	0.93	1.3
Any **None**	64 598	91 845	0.097	0.90	1.0

Table 9.7. *The validity of plain radiography in the diagnosis of painful spondylolysis, based on Libson* [24].

The definitive test of whether a pars defect is symptomatic is to anaesthetise the defect [36]. Pars blocks are the only means available by which to determine whether or not a radiographically evident defect is a symptomatic or an asymptomatic one. Such a test is imperative in view of the high prevalence of defects in asymptomatic individuals. Relief of pain implies that the defect is actually the source pain, and predicts surgical success [36]. Patients who do not respond to blocks pre-operatively are less likely to respond to fusion of the defect, even if the fusion is technically satisfactory [36].

However, pars blocks are not indicated in the investigation of patients with acute low back pain. They are a procedure reserved for the investigation of patients with persisting, if not chronic, symptoms. For the assessment of patients with a high risk of pars fractures, bone scan rather than plain radiography, is the better investigation (see below).

Hazards

Plain radiographs of the lumbar spine are not without hazards. These need to be balanced against requesting radiographs gratuitously, "just in case" or in the hope of finding something not suspected from history or clinical examination.

It has been estimated that

> the radiation dose of a lumbar spine series delivers 40 times the radiation dose received from a chest x-ray [2,37];
>
> a single lumbar spine series delivers to the gonads a radiation dose equivalent to that from having a daily chest radiographs for six years [2,3,38,39];
>
> the absorbed radiation from lumbar spine films is 2mSV; the risk of fatal cancer is one in 80,000 per mSV [4];
>
> one million lumbar spine radiographs can result in 20 excess deaths from leukemia, and 400 excess cases of genetic disease [2,4,37].

Notwithstanding these biological hazards, practical hazards obtain. Normal films may create a false sense of security. Lumbar spine radiographs may be false negatives in up to 41% of patients with known vertebral cancer [2]. Radiological evidence of vertebral osteomyelitis does not appear before 2 to 8 weeks of evolution of the disease; wherefore, a normal radiological picture does not exclude the diagnosis of spinal infection [40]. Since degenerative joint disease does equate to back pain, attributing the back pain to these findings is misleading [2,10].

Patients often harbour misconceptions about the utility and need for lumbar spine films [2,41,42]; they may believe that an x-ray will establish the diagnosis, or that a normal film will exclude serious pathology, and that x-rays are safe. Rather than indulge these misconceptions, practitioners have the opportunity of dissuading patients from their misconceptions, and explaining to them what evidence-based, quality care involves.

Practitioners concerned that patients' expectations can only be met by conceding to "order an X-ray" can be reassured that this is not the case. A controlled study [42] assessed the impact of a brief (5 minute) educational intervention for patients eligible for lumbar spine films. At follow-up, the proportion of patients in the educational group who believed that X-rays were necessary fell only slightly, but was substantially and significantly less (44% vs 73%) than in the control group. Fewer educated patients underwent radiography after the study, but there were no significant differences in patient satisfaction; and no serious diagnoses were missed.

Red Flag Conditions

It is perhaps for fear of missing a red flag condition that most practitioners, who do so, request plain films. Epidemiologically, this fear is not justified, and several studies have provided sobering, objective evidence against the unbridled use of plain films.

Liang and Komaroff [43] showed that the risks of radiation exposure and additional cost did not justify taking plain films on the first visit, compared to reserving radiographic studies until the eighth week for patients with continuing symptoms.

In a utilisation review covering 871 patients, Scavone et al [42] found that one in four lumbar films were normal, and that only one in eight were diagnostic. Most of those ostensibly diagnostic films, however, were of degenerative joint disease and spondylolysis, which are not diagnostic of either the source or cause of pain. The next largest group were “fractures”, but major fractures occurred only in patients with a history of major trauma, and minor fractures occurred only in elderly patients with osteoporosis. In ten patients (1%) metastases were revealed, but only two (0.2%) were new findings; the rest had a history indicative of cancer. There were four cases of osteomyelitis, but no data was provided as to whether, prior to radiography, these patients had signs or history indicative of infection.

In the light of these findings, Scavone et al [44] concluded that radiation exposure and the cost of non-contributory studies could be substantially reduced by the judicious consideration of the potential diagnostic yield of the examination.

In an earlier study, Scavone et al [1] established that AP and lateral lumbar spine films were an adequate study; there was no need to include oblique films. This echoes other reports on the same issue [45].

Deyo and Diehl [5] assessed the merits of a list of criteria for the use of plain films in primary care to screen for red flag conditions. Based on the literature, they tested a list of criteria that could apply to ordering plain films of the lumbar spine (Table 9.8). They compared 227 patients who satisfied one or more of the criteria with 84 who did not.

In no patient who did not satisfy the criteria did radiography reveal any unexpected or diagnostic findings. In the 227 patients who satisfied the criteria, findings on X-ray related to malignancy or fracture were identified in 15 (6.6%). There were no patients detected with osteomyelitis or spondylarthropathy.

1. Age more than 50 years	6. Drug or alcohol abuse
2. Significant trauma	7. History of cancer
3. Neurological deficit	8. Use of corticosteroids
4. Weight-loss	9. Temperature > 37.8^{o} C
5. Suspicion of ankylosing spondylitis	10. No improvement over one month
	11. Seeking compensation

Table 9.8. *Indications for the use of plain films of the lumbar spine, as studied by Deyo and Diehl* [5].

All four patients with malignancy had indications for radiography: three were aged over 50, and one had not responded to conservative therapy; two had unexplained weight-loss. The final diagnoses were lymphoma (2), metastatic prostate cancer (1) and retroperitoneal liposarcoma (1). However, only two of these four patients had lytic or blastic lesions; the other two had normal lumbar spine films. Thus, the criteria but not the films were 100% sensitive for the detection of cancer.

Of the 14 patients with fracture, 13 satisfied the criteria for radiography. Eleven were aged over 50, five had recent trauma, and three were seeking compensation. The one patient with a fracture who did not satisfy the criteria had an old transverse process fracture.

The results of this study vindicate reserving plain films for explicit criteria. Patients who do not satisfy the criteria do not need plain films of the lumbar spine. The chances of detecting a red flag condition under those conditions are essentially nil; which means that the chances of missing an important diagnosis are nil in patients who do not satisfy the criteria.

The criteria, therefore, constitute a proven guideline for reserving plain films. Following the guideline allows practitioners confidently, on the basis of evidence, to reduce the indiscriminate use of plain films, for fear of missing an important diagnosis.

On the other hand, the criteria ***do not*** guarantee finding an important diagnosis. Even under the criteria, the yield of an important diagnosis is only 6%. There is nonetheless 94% wastage.

In the study of Deyo and Diehl [5] the proportion of patients who satisfied the criteria was 390/621 (58%). This indicates that, on the average, only about half of all patients presenting with back pain warrant an X-ray. However, subsequent studies have challenged the utility of the Deyo and Diehl criteria, reporting that if followed, they actually result in higher utilisation of lumbar spine radiology than do intuitive protocols of responsible physicians [2,46]. In particular, they found that the age criterion had low specificity, and that in the absence of other red flags, this criterion could be relaxed without compromising sensitivity.

Other studies [3] and, indeed, Deyo and Diehl's own study [5] found the "seeking compensation" criterion to be neither specific nor sensitive. In no patient x-rayed for this reason was a significant finding detected [3,5]. Some 95% or more of patients exhibited normal findings or spondylosis. The remainder showed old fractures.

A study from an Emergency Department [3] found that in 482 patients presenting with back pain, radiographs were normal or showed only spondylosis in 86% of cases. Fractures were detected in 11% but the majority (9%) were chronic or of indeterminate age. None of the patients had major trauma. All the acute fractures occurred in patients with osteoporosis or in patients over the age of 64 who had suffered a fall. The seven cases of neoplasm occurred in patients with a known history of cancer, and all of whom were at least 60 years old.

In the light of these studies, the criteria of Deyo Diehl[5] can be modified without loss of security. In the pursuit of red flags conditions, plain radiographs should be reserved for:

- patients with a history of trauma,
- patients with a history of cancer,
- older patients with minimal trauma,
- failure to respond to treatment.

The previous criterion of "drug and alcohol abuse" is probably idiosyncratic of the American population that Deyo and Diehl[4] studied. For Australian purposes, the conditions sought for by this criterion can be covered by the criterion "risk factors for infection", viz. surgical procedures, body penetration, etc. (Chapter 7).

Although "neurological deficit" remains a putative indication for imaging, a patient with neurological signs should be investigated in accordance with the neurological deficit, and not because they have back pain.

Accordingly the criteria of Deyo and Diehl[5] can be re-cast as shown in Table 9.9.

For Low-Back Pain of Unknown Origin

Plain films of the lumbar spine should not be used as screening test for patients presenting with acute low back pain, unless a “red flag” condition is suspected.

Plain films may be used as a screening test for “red flag” conditions if a patient presents with any of the following features:

1. History of cancer
2. Significant trauma
3. Weight-loss
4. Temperature > 37.8^{o} C
5. Risk factors for infection
6. Neurological deficit
7. Minor trauma in patients
   - over the age of 50 years, or
   - known to have osteoporosis, or
   - taking corticosteroids
8. No improvement over one month

Table 9.9. *Modified criteria for the use of plain films in low back pain.*

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CAT Scans

CAT scans have no place in the investigation of low back pain of unknown or unsuspected origin. Even in the context of "red flag" conditions, their role is restricted to the confirmation of pathology otherwise indicated by history, clinical examination or other imaging tests. They have no place as a screening tool.

CAT scans may serve to confirm the diagnosis of disc herniation or other causes of radicular pain but in this context are indicated only if the patient's history and clinical features clearly indicate radicular pain and radiculopathy. These features, however, are distinct from those of low back pain of unknown origin. Back pain alone, or even back pain in association with somatic referred pain is not a sign of disc herniation, and cannot be justified as the basis for ordering a CAT scan.

Reliability

Formal studies, from which kappa scores might be calculated, of the reliability of reading lumbar CAT scans have not been reported. Such data as do exist, however, suggest substantial differences between observers with respect to recognising various features as worthy of reporting [1]. Some readers report certain abnormalities more frequently than others (Table 9.10).

	N	Herniated Nucleus Pulposus		Degenerative Joint Disease		Spinal Stenosis	
Age < 40	**21-24**	4	20%	0	0%	0	0%
Age > 40	**24-27**	7	27%	3	10%	1	3%
Reader 1	**45 (22+23)**	7	16%	1	4%	2	9%
Reader 2	**49 (24+25)**	15	31%	4	16%	2	4%
Reader 3	**51 (24+27)**	9	18%	3	12%	1	2%

Table 9.10 *The prevalence of abnormalities on CAT scan in a population 52 asymptomatic individuals aged between 21 and 80 years, based on Wiesel et al [1]. The percentage figures are as reported in the study (but rounded to integer values). The numbers have been derived from data provided in the paper, but in some instances are not internally consistent. This arises because not all readers reported on exactly the same number of films. Although the total number of films read by each reader was reported, the total read in each age group was not reported.*

Validity

The abnormalities most frequently encountered in CAT scans are common in patients with no symptoms [1] (Table 9.10). These figures, however, do not prove that there is no clinically or statistically significant relationship between symptoms and the presence of these abnormalities. That would require figures on the prevalence of these abnormalities in patients with symptoms. However, they do warn that finding herniated disc, degenerative joint disease or spinal stenosis on CAT scans does not prove that that abnormality is the cause of symptoms.

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MRI

Because of its relatively high cost, the use of MRI cannot be justified for the investigation of acute low back pain, even to screen for "red flag" conditions. Utilisation reviews attest to the relative paucity of "red flag" conditions rendered evident by MRI. In one review of 169 consecutive lumbar scans taken over a three month period, no cases of tumour or infection were recorded [3]. In another, covering 667 scans over a 13 month period, 102 neoplasms were reported [4] but 80% were tumors affecting the central nervous system rather than the lumbar vertebrae, and which presumably presented with neurological symptoms. A further 9% were post-operative investigations, and 5% were unspecified. Five cases of lymphoma were reported, but the presenting features of these patients were not described; it was not made evident whether they presented with neurological features or simply with spinal pain.

Reliability

A study has been published that reported separately the observations of two observers, but insufficient data were reported to allow kappa scores to be determined [2]. Observers are apt to disagree about disc bulges but are less likely to disagree about disc protrusions (Table 9.11).

BULGE		**Number of positive cases reported by each of two observers**									
N	**Age**	**L1-2**		**L2-3**		**L3-4**		**L4-5**		**L5-S1**	
		Obs 1	**Obs 2**	**Obs 1**	**Obs 2**	**Obs 1**	**Obs 2**	**Obs 1**	**Obs 2**	**Obs 1**	**Obs 2**
20	**20-29**	0	0	0	0	4	0	5	2	4	2
28	**30-39**	2	1	1	1	4	1	6	8	4	3
23	**40-49**	1	0	1	2	3	8	7	10	5	8
17	**50-59**	3	3	5	4	10	8	9	6	12	9
10	**>60**	0	1	1	4	4	5	5	6	4	5

PROTRUSION		**Number of positive cases reported by each of two observers**									
N	**Age**	**L1-2**		**L2-3**		**L3-4**		**L4-5**		**L5-S1**	
		Obs 1	**Obs2**	**Obs 1**	**Obs2**	**Obs 1**	**Obs2**	**Obs 1**	**Obs2**	**Obs 1**	**Obs2**
20	**20-29**	0	0	0	0	0	0	3	2	2	1
28	**30-39**	1	1	1	1	1	1	5	2	2	2
23	**40-49**	0	1	0	0	1	0	5	3	4	4
17	**50-59**	0	0	1	1	2	1	2	4	0	0
10	**>60**	0	0	2	1	1	0	4	0	3	1

Table 9.11 *Observer concordance in the identification and reporting of disc bulges and disc protrusion in MRI scans of 98 asymptomatic individuals based on Jensen et al [2]. N: number of subjects examined in each age group. Obs: observer.*

Validity

Two studies have reported the prevalence in asymptomatic individuals of certain abnormalities encountered in MRI scans but which otherwise have sometimes been implicated as diagnostic back pain [1,2]. Herniated discs, disc bulges, spinal stenosis and disc degeneration all occur in asymptomatic individuals (Tables 9.12, 9.13, 9.14). They occur with increasing frequency with age. Disc degeneration is virtually ubiquitous in individuals over the age of 60. Spinal stenosis occurs in asymptomatic individuals only over the age of 60. Disc bulges are more common than disc protrusions. Both are more common at lower lumbar levels.

The prevalence of abnormalities in the MRI scans of asymptomatic individuals has been used to indict the use of MRI scans; but although this nihilism might be justified for abnormalities such as degeneration and disc bulge, it is not justified for disc protrusion. Disc protrusion on MRI correlates positively, although not strongly with back pain (Table 9.15). Correlation with sciatica has not been formally reported.

	N	Herniated Nucleus Pulposus		Disc Bulge		Spinal Stenosis		Disc Degeneration	
All ages	67	16	24%			3	4%		
Age 20-39	35	7	20%	19	54%	0		12	34%
Age 40-59	18	4	22%			0			
Age 60-80	14	5	36%	11	79%	3	21%	13	92%

Table 9.12 *The prevalence of abnormalities on MRI scans of 67 asymptomatic individuals, as reported by Boden et al [1].*

BULGE		**Prevalence by Segmental Level**				
N	**Age**	**L1-2**	**L2-3**	**L3-4**	**L4-5**	**L5-S1**
20	**20-29**	0%	0%	0 - 20%	10 - 25%	10 - 20%
28	**30-39**	3 - 7%	4%	4 - 14%	21 -28%	11 - 14%
23	**40-49**	0 - 4%	4 - 9%	13 - 34%	30 - 43%	22 - 35%
17	**50-59**	18%	23 - 29%	47 - 59%	35 - 53%	53 - 71%
10	**>60**	0 - 10%	10 - 40%	40 - 50%	50 - 60%	40 - 50%

PROTRUSION		**Prevalence by Segmental Level**				
N	**Age**	**L1-2**	**L2-3**	**L3-4**	**L4-5**	**L5-S1**
20	**20-29**	0%	0%	0%	10 - 15%	5 - 10%
28	**30-39**	4%	4%	4%	7 - 18%	7%
23	**40-49**	0 - 4%	0%	0 - 4%	13 - 22%	17%
17	**50-59**	0%	6%	12%	12 - 24%	0%
10	**>60**	0%	10 - 20%	0 - 10%	0 - 40%	10 - 30%

Table 9.13 *The prevalence of abnormalities on MRI scans of 98 asymptomatic individuals, based on Jensen et al [2]. Ranges of percentages obtain because of differences between observers.*

Anular defects	14%
Degenerative Joint Disease	8%
Spondylolysis	7%
Spondylolisthesis	7%
Spinal stenosis	7%

Table 9.14 *The prevalence of other abnormalities evident on MRI in asymptomatic individuals, based on Jensen et al* [2].

	Symptomatic	Asymptomatic	Sens	Spec	LR
Protrusion	**14**	**27**	**0.52**	**0.72**	**1.9**
No Protrusion	**13**	**72**			

Table 9.15 *The correlation between back pain and disc protrusion on MRI, based on Jensen et al* [1].

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Bone Scan

Bone scanning with ^{99}Tc is a very sensitive test for lesions of the lumbar spine that involve hyperaemia. As such it is perhaps the preferred tests for screening for possible sites of infection [1]. Only rarely might the test be false negative, in cases where the infected area has infarcted [1]. In this regard, however, bone scanning is indicated only if there are clinical grounds for suspecting a red flag condition.

Where bone scanning is perhaps more pertinent in the context of acute low back pain is in the detection of incipient fracture of the pars interarticularis. Detecting a stress reaction prior to fracture optimises the opportunity to avert fracture by instituting rest and avoidance of the activities responsible for the bone fatigue.

Since bone scans show reactive bone the can show stress reactions, a recent fracture, or a healing fracture [2,3]. Bone scans are of no value is symptoms have been present for longer than one year [2].

Once a pars fracture has occurred, the role and utility of bone scan is questionable, for the relationship between pain, radiographic defects and positive bone scans is imperfect. In patients with a radiographically evident pars defect, positive scans are related to history and pain but imperfectly (Table 9.16). Pars defects are not positive on bone scan in asymptomatic individuals; they may be positive in patients with chronic back pain or patients with a history of repeated minor trauma; they are more likely to be positive in patients with a history of a traumatic incident, but not reliably so [4].

HISTORY	BONE SCAN	
	Positive	**Negative**
Trauma within 1 year	9	4
Repeated minor trauma	9	20
Chronic back pain	5	35
No pain	0	14

Table 9.16. *Relationship between history and bone scan in patients with a radiographically evident pars defect, based on Lowe et al [4].*

In athletes with back pain, one study showed that most patients suspected of having a pars fracture were negative to both bone scan and X-ray [5] (Table 9.17). Nine patients had a pars defect on X-ray that was negative on bone scan. Four patients had five pars defects that were positive to both tests; and four patients each had one defect that was positive to both tests but another defect that was positive on scan but not X-ray.

BONE SCAN	X-RAY	
	Positive	**Negative**
Positive	**9**	**4**
Negative	**9**	**16**

Table 9.17. *Correlations between bone scan and X-ray in 33 athletes with suspected spondylolysis, based on Elliot et al[5].*

Another study of athletes [6,7] showed a spread of relationships (Table 9.18). Of the seven patients with positive scans but negative radiographs, all were able to return to sport, and follow-up radiographs revealed no defects. Of the 18 with both tests positive, five returned to sport and follow-up studies revealed improvement or resolution of the bone scans but persistence of the radiographic defect. Three of 18 patients did not return to sport 10 were lost to follow-up.

BONE SCAN	X-RAY	
	Positive	**Negative**
Positive	**18**	**5**
Negative	**7**	**7**

Table 9.18. *Correlations between bone scan and X-ray in 37 athletes with back pain, based on Jackson [6,7].*

BONE SCAN	X RAY	
	Positive	**Negative**
Positive	**5**	**1**
Negative	**22**	**38**

Table 9.19. *Correlations between bone scan and X-ray in 66 patients with back pain, based on Van den Oever [8].*

These data suggest the following indications:

1. In an individual at risk of a stress fracture, a bone scan is the investigation of choice to screen for stress reactions prior to fracture. In principle, this action is likely to be sensitive in that if a patient does have a stress reaction a bone scan will detect it, but it will not be specific because most individuals with back pain will have neither a stress reaction nor a positive scan. In this regard, the study of Elliot [5] is germane in that it showed that most patients suspected of a stress fracture were negative to both scan and X-ray. Therefore, the problem with this indication is that it is likely to yield many negative results. Physicians, therefore, need to be judicious about ordering scans, lest they over-order this investigation. Indeed, in a general population the yield of positive scans is very low and bone scans are of little value for primary diagnosis (Table 9.19). Accordingly scans are best reserved until after simple conservative therapy has failed.

2. If the scan is negative, no radiography is indicated; for whatever the radiographs show will be immaterial or invalid. If the radiographs are negative they are redundant for the scan is already negative. If the radiographs show a defect they are irrelevant, for there is nothing to say that the defect, which is present on X-ray but "cold" on scan, is not just an incidental finding.

3. If the scan is positive, radiographs should be taken to determine if a fracture has occurred. If the radiographs are normal, rest and avoidance of activities should be instituted in an effort to avert progression to fracture.

4. If the scan is positive and the radiographs are also positive, the evidence implies a recent fracture that might be presumed, but not guaranteed, to be the source of pain. Rest and avoidance of activities can still be prescribed, as it is still possible for healing to occur.

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SPECT Scanning

SPECT scanning offers the advantage of providing better resolution of the anatomical location of hyperaemia evident on technetium bone scanning. Accordingly it has attracted application as a screening test for low back pain. However, its utility has not been established.

A systematic review[1] found the literature to be weak; only three of 13 reports provided a reasonable criterion standard against which the validity of SPECT could be determined. The review concluded that there was weak evidence for the utility of SPECT for detecting pseudarthroses after spinal fusion, and distinguishing benign from malignant lesions in cancer patients. Neither of these applications pertains to acute low back pain.

SPECT does appear to be marginally more sensitive than planar bone scanning for the detection of painful pars defects [2,3], and some authors have argued that a negative SPECT scan essentially rules out a stress fracture. In patients with a high risk of stress fracture, in whom it is critical to exclude a stress reaction, SPECT would be the investigation of choice.

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Chapter 10. Psychosocial Assessment

Introduction

In order to highlight the importance of psychosocial factors in the assessment of patients with low back pain, psychologists developed the notion of "yellow flags". This notion arose out of a consideration of prognostic risk factors (Chapter 6). Just as there are “red flag” medical conditions that need to be recognised early in the patient’s history (Chapter 7), there are psychosocial conditions or behaviours that some authorities believe should be recognised early in the patient’s history, and managed. The basis for this belief is that certain psychosocial factors are associated with a poor prognosis. On the grounds that it may be too late to deal with these factors once the patient has developed chronic pain, these authorities have urged an earlier recognition and intervention, the prospect being that remediation of psychosocial factors early in the course of the patient’s illness might avert or reduce chronic disability. The descriptor - “yellow flags”, refers to these factors, with the intention of emphasising that they should be recognised, although not as urgently as the “red flag” conditions.

With respect to low back pain, many of the psychosocial factors that constitute yellow flags stem from the fear-avoidance model (Chapter 6). They are the fears and beliefs that patients may express or harbour, that putatively interfere with their rehabilitation by reducing their motivation to stay active or to resume activity, and which thereby compound the patient’s disability. The prospect is that by changing these counter-productive beliefs and behaviours, physical and social rehabilitation will be improved and disability will be reduced.

Definition

Yellow flags are not a specific condition, but behaviours and beliefs that individually constitute proven or presumed risk factors for chronicity of back pain, and which take on putatively greater significance when present in clusters or in great numbers in a given patient. Without limiting the possibilities [1], the cardinal yellow flags are listed in Table 10.1

WORK	**BEHAVIOURS**
belief that pain is harmful, resulting in fear-avoidance behaviour	passive attitude to rehabilitation
belief that all pain must be abolished before attempting to return to work or normal activity	use of extended rest
expectation of increased pain with activity or work	reduced activity with significant withdrawal from activities of daily living
fear of increased pain with activity or work	avoidance of normal activity
belief that work is harmful	impaired sleep because of pain
poor work history	increased intake of alcohol or similar substances since the onset of pain
unsupportive work environment	
	AFFECTIVE
BELIEFS	depression
	feeling useless and not needed
catastrophising, thinking the worst	irritability
misinterpreting bodily symptoms	anxiety about heightened body sensations
belief that pain is uncontrollable	disinterest in social activity
poor compliance with exercise	over-protective partner/spouse
expectation of “techno-fix” for pain	socially punitive partner/spouse
low educational background	lack of support to talk about problems

Table 10.1. *A list of the cardinal yellow flags*

Evidence

At present there is absolutely no evidence that identifying and managing yellow flag conditions results in reduced disability associated with acute low back pain. Such belief that it could do so is based on extrapolation from experience with other conditions and experience with chronic low back pain.

Indeed, the New Zealand Guidelines for yellow flag conditions [1] outline a comprehensive approach to yellow flag conditions but provide no references, at all, to literature on efficacy. The one citation is an unpublished outline of the concept. No other Guidelines explicitly for yellow flag conditions have been published, although they are included in the British Guidelines for acute low back pain [2].

At present, any attraction of the yellow flag concept rests on its concept validity. It seems plausible that psychosocial factors may hinder the rehabilitation of some patients. It seems plausible that some of these factors might be remediable. It seems plausible that eliminating or reducing some of these factors might improve rehabilitation and reduce chronicity.

There is, nonetheless, a great deal of consensus support for the concept, as evidenced by the publication of the New Zealand Guidelines [1], with the participation of eminent authorities on behavioural aspects of low back pain.

Implementation

One advantage of the yellow flag concept is that its implementation does not require or involve a major or costly modification of medical practice with respect to acute low back pain. It does not require special investigations or treatment (in the first instance). Rather, attention to yellow flags constitutes only good medical practice by ensuring attention to personal and behavioural dimensions of a patient who reports low back pain. This attention can be integrated into the management of patients without interfering with, and without replacing, any biological, medical management. In essence, it is no more than a formal description of what should, in any case, be good medical practice.

The absence of a definitive evidence-base for yellow flags renders the concept a conjecture in a scientific sense. Therefore, practitioners who implement the yellow flags concept should do so in the knowledge that they exploring an unproven idea. But it is an idea that imposes no risk of harm, yet has the prospect of benefiting the patient, and also providing the treating doctor with an option that may help them cope with what might appear a difficult and complex patient-problem.

Some practitioners may be unfamiliar with, or uncomfortable with, formally recognising and managing behavioural problems. However, the yellow flag concept does not call for consummate expertise. Rather, it seeks to highlight, in the first instance, the need to recognise problems. To do so is no more than good medical practice. Moreover, guidelines have been developed to assist medical practitioners recognise the yellow flag conditions. Furthermore, guidelines have been formulated to assist medical practitioners to manage these conditions if they feel so able. It is only in the event of major or difficult problems that formal referral to experts is indicated [1].

Guidelines

Recognition

The New Zealand Guidelines describe how yellow flag conditions can be recognised, both by way of conventional medical interview, and by way of a simple questionnaire. That questionnaire has not been validated; it is still under evaluation; but it provides a handy, expeditious means of screening (putatively) for yellow flag conditions.

Without resorting to questionnaires, practitioners can include an exploration of yellow flags in the course of usual interactions with patients. The objective is to look for [1]

- beliefs that back pain is harmful or potentially severely disabling
- fear-avoidance behaviours
- tendency to low mood and withdrawal from social interaction
- an expectation that passive treatments rather than active participation will help

Questions that can be rephrased into the practitioner's own style are [1]

- What do you understand is the cause of your back pain?
- What are you expecting will help you?
- How is your employer responding to your back pain? Your family? Your co-workers?
- What are you doing to cope with your pain?
- Do you think that you will return to work?

The source literature on fear-avoidance behaviour includes short and long questionnaires that have been used to identify patients with yellow flags [3,4]. The administration of these questionnaires could be cumbersome or intrusive. However, the items from these questionnaires that ostensibly signify yellow flag risk factors can be introduced into conventional interactions with patients.

Fear-avoidance behaviour can be suspected if the patient indicates that

(PHYSICAL ISSUES)

- Physical activity makes their pain worse
- Physical activity might harm their back
- They should not do physical activity which might make their pain worse
- They avoid
  - lifting heavy objects
  - bending
  - walking
  - standing
  - sitting
  - physical exertion
  - stairs
  - stretching or carrying
  - travelling by public transport
  - travelling in a car

(DOMESTIC ISSUES)

- They avoid
  - cooking
  - housework
  - gardening
  - cleaning car
  - shopping
  - odd jobs

(SOCIAL ISSUES)

- They avoid
  - spending time with family
  - going to restaurants
  - going to pub
  - sex
  - going out
  - going to parties
  - visitors

(VOCATIONAL ISSUES)

- Their pain was caused by their work
- Their work aggravated their pain
- Their work is too heavy for them
- Their work makes their pain worse
- Their work might harm their back
- They should not do their normal work with their present pain
- They do not think that they will be back to their normal work within three months
- They avoid going to work

The assessment of yellow flags should be part of any ongoing management of a patient, at any time in the course of their problem. The New Zealand Guidelines [1] recommend the administration of their screening questionnaire at 2-4 weeks after onset of pain. There is no evidence that this is the optimal time. This is early in the natural history of complaints of low back pain, and other interventions may take this long to achieve their effects. Indeed, over this time frame, practitioners may still be concerned about red flag conditions, and their time with the patient may still be consumed with medical matters such as ensuring compliance with home rehabilitation and analgesics.

At the other extreme, waiting until the patient develops chronic pain (3 months) may be too late; the window of opportunity to prevent chronicity will have passed, by definition. Therefore, in patients with persisting pain, formal exploration of yellow flags should occur no later than 2 months after onset of pain, and possibly by the end of the first month. A practicable approach would be to commence exploration of yellow flag issues at the 1-month follow-up of patients, and consolidate the exploration by 2 months.

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Chapter 11. Treatment

Criteria

In 1995, the NH&MRC prescribed a schedule of levels of evidence by which the efficacy of treatments could be assessed (Table 11.1).

Grade	**Definition**
I	Evidence obtained from a systematic review of all relevant randomised controlled trials
II	Evidence obtained from at least one properly-designed randomised controlled trial
III - 1	Evidence obtained from well-designed controlled trials without randomisation
III - 2	Evidence obtained from well-designed cohort or case-control analytic studies preferably from more than one centre or research group
	Evidence obtained from multiple time series with or without the intervention
IV	Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees

Table 11.1. *Rating scale for quality of evidence recommended by the NH&MRC in 1995* [1].

Subsequently, the NH&MRC revised this schedule (Table 11.2). The cardinal changes were the elaboration and demotion of certain types of level III evidence, and the elimination of opinions and consensus as an admissible form of evidence.

Grade	**Definition**
I	Evidence obtained from a systematic review of all relevant randomised controlled trials.
II	Evidence obtained from at least one properly designed randomised controlled trial.
III - 1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).
III - 2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case-control analytic studies, or interrupted time series with a control group.
III-3	Evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.
IV	Evidence obtained from case series, either post-test or pre-test and post-test.

Table 11.2. *Rating scale for quality of evidence recommended by the NH&MRC in 1999* [2].

Furthermore, the NH&MRC [2] distinguished between "surrogate" outcome measures, (such as a change in a physiological variable), and "clinical" outcomes, and "patient-relevant" outcomes. It asked that emphasis being given to clinical and patient-relevant outcomes. These would include relapses, re-admission rates, measures of impairment, pain scales, functional status, disability, and patient satisfaction.

In the context of low back pain, a surrogate outcome might be improved range of movement; a clinical outcome might be relief of pain; a patient-relevant outcome might be return to work and no further need to pursue health care.

By these measures, the NH&MRC set very high standards, which little of the literature on low back pain can achieve. Although there have been systematic reviews (Level I evidence), and although there have been randomised controlled trials (Level II evidence), little of this literature has addressed the multiple and patient relevant outcome measures required by the NH&MRC. Either single or a limited number of outcome measures have been addressed, or significant improvement has been reported in only one or a few of several measures, with no change in others. Thus, although there is evidence, it is frequently limited in depth.

Level I Evidence

In an atmosphere of competition, proponents of particular types of treatment for back pain are keen to have their treatment recognised as being endorsed by Level I evidence. In political terms, a treatment supported by Level I evidence can be publicised as being superior or preferable to treatments supported by only Level III, or even just Level II, evidence. With respect to low back pain, however, there is a risk of the efficacy of treatments being overstated just because there is so-called Level I evidence in support of it.

Systematic reviews of the literature on low back pain have regularly lamented the poor quality of the studies harvested. Few of the studies match the statistical rigour and quality of literature in other fields of Medicine. Consequently systematic reviews have tended to be what may be described as lenient, in that they have accepted any statistically significant difference, in any variable, as positive evidence of efficacy. Rarely have these differences been between the index treatment and well-designed placebo control treatment. Most often they have occurred between the index treatment and some other treatment. What becomes contentious is when the reference treatment (with which the index treatment is compared) is itself a poor treatment, or one that has been shown to be less than effective in other studies. In that event, even though an effect in favour of the index treatment has been demonstrated, it is not evidence that the index treatment is superior to placebo; or as good, let alone better, than a more competitive treatment. As a result, it is possible to produce Level I evidence on the grounds of comparing two inferior treatments but finding one superior to the other. Whereas technically this satisfies the definition of Level I evidence, it is not necessarily evidence of worthwhile efficacy.

Similarly, although systematic reviews and controlled studies report statistically significant differences between treatments, rarely have effect-sizes and clinical significance been reported or discussed. Instead, reviewers and authors have been content to use a p value of less than 0.05 as "proof" that the treatment "works". Furthermore, such statistical differences have often, if not usually, pertained to group differences. Specific analyses, such as the proportion of patients achieving nominated levels of improvement are lacking. This reliance on p values as the only necessary proof of efficacy runs contrary to contemporary expectations, which demand measures of efficacy such as confidence intervals and numbers needed to treat [3,4,5,6]. Such measures are far more informative and revealing, for they establish exactly what proportion of patients can expect to achieve various levels of outcome. P values alone do not provide this insight. They show only that, on the average, some patients undergoing the index treatment can expect to fare somewhat better than patients undergoing the comparison treatment can. Whether or not the difference is clinically significant or meaningful to the patient is not revealed by a p value.

Consequently, in the field of back pain, the mere existence of Level I evidence does not necessarily vindicate the absolute efficacy of a treatment. Greater insight is provided by examining the details of the Level II evidence on which systematic reviews have been based. Fortunately and mercifully in this regard, the number of Level II studies is small, and does not prohibit examination of individual studies in order to assess the strength of the so-called Level I evidence. In some instances, such an exercise reveals ironies or paradoxes in the conclusions of systematic reviews. It also reveals when efficacy is claimed on the basis of few or suboptimal outcome measures; or on the basis of clinically trivial differences.

Format

The literature offers a range of possible interventions for acute low back pain. The evidence concerning each ranges in volume, quality, and conclusions. The following chapters are arranged, in general, in an order from those with the strongest positive evidence and which have been preferred or endorsed by international authorities, to those where the evidence is incomplete, contentious, or negative.

Where Level I and Level II is available, the assessment of efficacy is based on that literature, on the grounds that no amount of Level III or Level IV evidence outweighs good quality Level II and Level I evidence. In the absence of Level I or Level II evidence, the assessment is based on Level III evidence.

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Chapter 12. Activity versus Bed Rest

For no other treatment of acute low back pain are the results of studies as consistent and uniform as they are for bed rest and activity. Two systematic reviews [1,2] have reached the same conclusions.

The first review [1] was published in 1994, and covered five studies of bed rest. The second review [2] identified a further three studies published since that time or not included in the first review. All eight acceptable trials found bed rest to be ineffective. Two trials showed that bed rest for 7 days is no better than bed rest for 2-3 days. Five trials showed that rest for 2-4 days was no different or worse than no bed rest. Bed rest is no different or less effective than alternative treatments in terms of rate of recovery, relief of pain, return to daily activities, and time lost from work.

Eight trials of advice to stay active showed consistent findings [2]. Three trials showed faster return to work, and reduced time off work in the following year. All trials showed reduced use of health care, and reduced chronic disability. Conspicuously no trials found that early activity had any harmful effects.

Two trials that compared bed rest with advice to stay active showed that ordinary activity produced faster recovery.

On the strength of this evidence, bed rest has no place in the management of acute low back pain. Rather, patients should be advised to remain active. Specifically how this might be achieved is pursued in Chapter 13.

RECOMMENDATIONS (strong Level I evidence)

Bed rest should not be prescribed as a treatment for acute low back pain.

Irrespective of other interventions that might be used, patients with acute low back pain should be advised to stay active and resume their normal activities of daily living.

The lack of benefit of bed rest should be explained to patients, and the alternatives explained, justified and promoted.

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Chapter 13. Reassurance and Home Rehabilitation

Fear is a strong predictor of poor outcome in patients with acute low back pain [1] (see also Chapter 6). Patients may not understand what is causing their pain, and fear that it is a serious and threatening disease. They may be afraid that movement, activity, or work may worsen the pathology. They fear aggravation of their pain if they move or maintain normal activities.

If fear is a major determinant of chronicity of low-back pain, reassurance should be a major factor in minimising chronicity. This has been demonstrated in a seminal controlled trial.

Indahl et al[2] studied patients who had been suffering back pain for at least eight weeks but not more than 12 weeks. They randomly allocated 512 patients to undergo control therapy which consisted of no active intervention from the research team but freedom to undertake whatever therapy was offered to them by their own medical officers. The active treatment group of 463 patients received a program of intervention:

1. Patients were provided with a biological model of their pain. They were told how a possible crack in a disc could cause inflammation in innervated parts of the disc and that this could cause reflex contraction of the paraspinal muscles; that this activation would diminish circulation in the muscles and lead to stiffness and pain; that pain and anticipation of pain could add to the binding and guarding of the back which would lead to increased muscle contraction and increased pain.

2. Patients were assured that light activity would not further injure the disc or any other structure that could be involved in the process, and that, rather, it was more likely that it would enhance the repair process. They were told that low-back pain should be thought of as a sign that the circulation in the muscles was inadequate and that their response should be to alleviate this condition.

3. The link between emotions and low-back pain was explained as a muscular response and that increased tension in muscles for whatever reason would increase the pain and thereby add to the problem. It was explained how long-standing pain could create vicious circles and chronic pain as a result. The point that the worst thing they could do to their backs was to be careful, was strongly emphasised.

4. All patients, regardless of clinical and radiographic findings, were told to mobilise their lumbar spine by light activity. No fixed exercise goals were set, but patients were given guidelines and encouraged to set their own goals. Great emphasis was put on the effort to remove fear about low-back pain and focus on sickness behaviour.

5. Misunderstandings about back pain were dealt with.

6. The principal recommendation was to normalise gait, as well as to try to walk as flexibly as possible. Activities involving static work for the back muscles were discouraged.

7. Acute attacks of back pain were to be treated as an acute muscle spasm with stretching and light activity.

8. With respect to lifting:

   twisting when bending was to be avoided;
   for heavy objects, patients were to use the thighs with a vertical back;
   at other times, they were to use the back and flex it; patients were not to be afraid.

Instruction was reinforced at three months and at one year. Patients were free to call the investigators if they felt any need for to do so.

Figure 13.1 summarises the results. The actively treated patients exhibited a clinically and statistically significant difference from the control group with respect to decrease in sickness-leave. At 200 days, 60% in the control group but only 30% in the intervention group were still on sickness-leave. At the end of the study, 64 patients from the control group but only 24 from the intervention group were still on sickness-leave

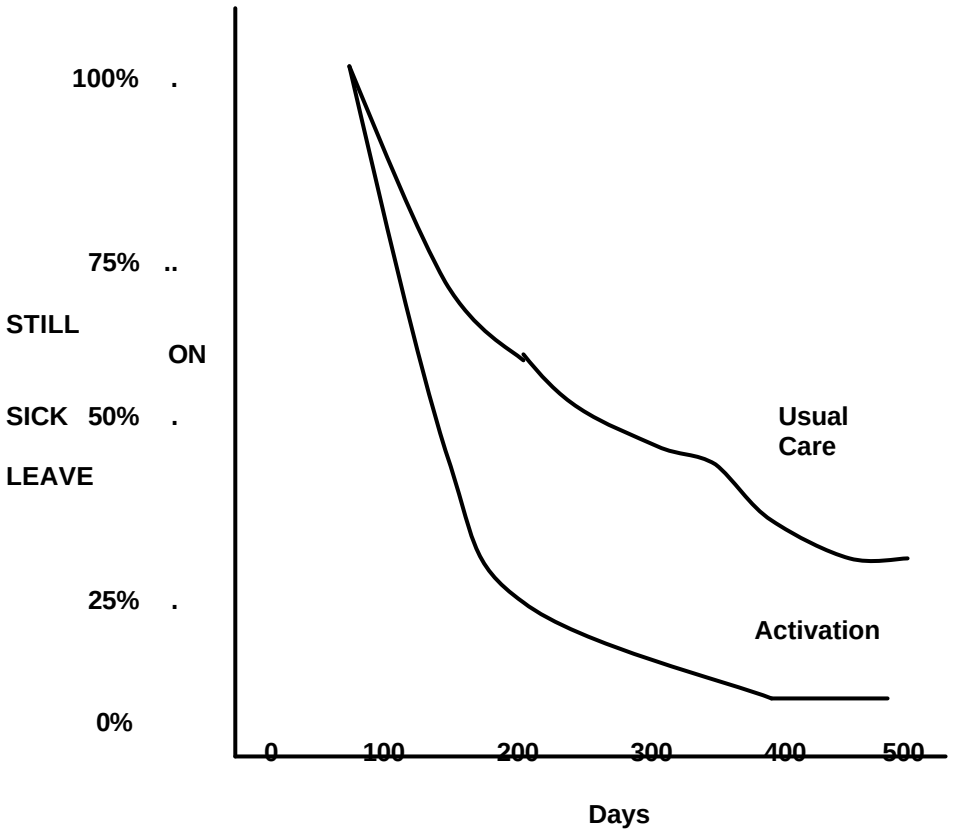

Figure 13.1. *Survival curves comparing the proportion of patients still on sick leave after treatment by activation or under usual care. Based on Indahl et al [2].*

This study demonstrated, under controlled conditions, that a simple program of reassurance and elementary rehabilitation instruction is more successful at reducing sickness-leave than conventional therapies, for patients who had been on sickness-leave for more than 8 weeks but not more than 12 weeks. A five-year follow-up demonstrated that these differences were maintained [3]. Only 19% of the intervention group were still on sick leave at five years, compared with 34% in the control group.

Although this intervention was applied to patients with subacute back pain, there is nothing, in principle, logistically, or financially, that prevents it from being applied earlier to patients with acute low back pain.

RECOMMENDATIONS (strong Level II evidence)

Provide patients confidently with a sound biological model of their pain. Explain why they have pain.

Confidently assure patients

- ***that light activity will not further injure the disc or any other structure that could be involved in their pain, and***
- ***that it is more likely that, rather, it would enhance the repair process.***

Explain

- ***that increased tension in muscles, for whatever reason, would increase the pain and thereby add to the problem;***
- ***that long-standing pain could create vicious circles and chronic pain as a result, and***
- ***that the worst thing they could do to their backs was to be careful.***

Stipulate that all patients must mobilise their lumbar spine by light activity.

It is not necessary to set exercise goals, but provide patients with guidelines and encourage them to set their own goals.

Make every effort to remove fear about low-back pain and avoid sickness behaviour.

Enquire about and redress any misunderstandings about back pain.

Encourage and help patients to try to walk as flexibly as possible.

Discourage activities involving static work for the back muscles.

Treat acute attacks of back pain as an acute muscle spasm with stretching and light activity.

With respect to lifting, instruct patients:

- ***to avoid twisting with bending,***
- ***to use the thighs with a vertical back for heavy objects,***
- ***to use the back and flex it at other times,***
- ***not to be afraid to lift.***

Reinforce instruction at three months and at one year.

Remain available to see the patient at their request.

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Chapter 14. Exercises

Introduction

Exercises have long been a mainstay of treatment for back pain, both acute and chronic. Their nature varies, and includes isometric exercises, endurance exercises, intensive exercises, graded exercises, flexion exercises, extension exercises, and exercises specific to certain presumed diagnoses. So entrenched is the faith that exercises are good and appropriate for back pain that they almost constitute a "sacred cow". As a result, any disagreement with the validity of exercises as a therapy is met with vehement criticism and defence.

Rationale

An explicit rationale for exercises for back pain is hard to find in the literature. A convenient summary, however, is that of Jackson and Brown [1]. They maintain that exercises may be beneficial to decrease pain; strengthen weak muscles; decrease mechanical stress by stretching tight muscles; improve fitness; improve trunk mobility; and provide conditioning. These objectives fall into two groups - symptomatic and mechanical.

Quite clearly, but not overtly, exercises are prescribed if and because patients present with pain. Implicitly, exercises are supposed to benefit that pain, as if exercises are a form of analgesic. However, how exercises are supposed to decrease pain has never been explained; nor has it been unequivocally demonstrated that exercises *per se* do relieve pain (as opposed to other factors operant in an exercise program).

This lack of relationship, and the failure of studies to show consistent or clinically significant relief of pain has generated a paradigm shift - that, whether or not exercises relieve pain, they at least can be shown to achieve mechanical changes.

Strengthening muscles, stretching tight muscles and improving fitness all seem laudable objectives, but their relationship to back pain is either unclear or elusive. Rather, the mechanical rationales for exercises are loosely based on observations from epidemiologic studies that show that, on average, patients with back pain tend to have weaker muscles and be less fit; but these relationships are far from absolute; the distributions of muscle strength and fitness in patients with and without back pain are great and overlap considerably. Furthermore, there are no compelling data that show that muscle weakness produces pain or that restoring strength relieves pain. There are no data that show that an examiner can reliably detect abnormally tight muscles. There are no data that show that lack of fitness causes pain, or that restoring fitness relieves pain.

There is no clear relationship between mobility and pain other than patients with back pain are prevented by their pain from exhibiting an expected full range of motion. It has not been shown that lack of mobility causes pain and that, therefore, restoring mobility should relieve pain. Nevertheless, it is commonly believed that immobility is somehow deleterious for the back. This belief is based on the assumption that back pain implies some sort of injury, and that this injury must be allowed to heal, but by analogy with disorders of the appendicular skeleton, this healing must not be allowed in a position of rest for fear of developing painful stiffness; therefore, painful backs must be mobilised[2]. However, while so long as the causative lesion of back pain remains unknown, this principle is no more than a generic principle of musculoskeletal medicine that has been applied to the back without any concrete link to spinal pathophysiology.

At best, the available data allow that if muscles are strengthened and stretched, if mobility is restored and if fitness is improved, patients may also obtain relief of pain. However, the operant factor in this expected relationship is not known, and it is not entirely evident that exercises do benefit pain. In acute back pain, the passage of time and natural history may be the operant factor. In acute back pain and in chronic back pain, a Hawthorne effect may operate. These considerations have bedevilled the empirical evaluation of the efficacy of exercises for back pain.

Efficacy

Level I Evidence

There have been four systematic reviews of exercises for back pain: one surveyed the literature from 1966 to 1990[3], a second completed the period - 1991 to 1995[4]. The third review[5] covered 1975 to 1993. The most recent review covered the literature from 1966 to 1995[6]

The first review found four studies on acute back pain, one on subacute back pain, and seven on chronic back pain, and lamented the poor quality of research on this topic[3] It concluded that "despite its frequent application, exercise therapy has not been shown to be more efficacious than any other treatment modalities, nor has it been shown to be ineffective. There is little evidence in favour of a specific exercise regime."[3].

The second review found an additional 11 studies (four on acute back pain, one on subacute back pain, and six on chronic back pain) [4]. Studies with a better methodological score reported negative results. The few studies that reported positive results had low methodological scores. The review concluded, "In patients with acute back pain, exercise therapy is ineffective. The graded activity program with exercises in patients with subacute back pain and intensive extension exercises or fitness exercises in patients (with) chronic back pain deserves attention. There is a need for more research to clarify the efficacy of the McKenzie therapy and that of the different components of the graded activity program with exercises. Also, additional trials in patients with chronic back pain are needed in which fitness exercises are compared with intensive training." [4].

The third review [5] echoed the conclusions of the other reviews. It found that "For sudden, non-neurologic mild backache in a general population, there appears to be little benefit from an acute exercise program, particularly if patients can be guided to (return to work) on their own within 2 weeks." [5].

In the context of acute low back pain, the fourth review[6] found ten randomised-controlled trials, two of high quality and eight of low quality. Seven trials, including the two high quality studies, reported negative results. The review concluded, "there is strong evidence that exercise therapy is not more effective than other conservative treatments, including no intervention for acute low back pain".

Contemporary authorities recommend exercises in order to maintain mobility and functional activity despite pain, while other interventions or natural history address their pain[7]. In this regard, exercises are used not for muscle-specific reasons but rather as the antithesis to bed rest or immobilisation[7,8,9]. (See also Chapters 12 and 13.)

Proponents of exercise therapy have criticised negative studies on the grounds that they did not specifically tailor the exercises used to the patients concerned or that the exercises were trivial[10-12]; but these proponents have not furnished evidence to justify their faith to others, and their criticisms have been answered[13].

Level II Evidence

Recent studies not covered by previous systematic reviews provide additional information concerning the efficacy of exercises.

One study compared McKenzie therapy with chiropractic manipulation and with an educational booklet [14]. The outcome measures used were pain score, the Roland Disability Scale, use of health care, and time lost from work. At four weeks and at 12 weeks after treatment, there were no significant differences in outcome between each of the groups, in any of the outcome measures. This study answers the call of the second systematic review above [4] which asked for more research to clarify the efficacy of McKenzie therapy.

The second study compared a program of exercises with usual care [15]. The usual care consisted of treatment by a general practitioner and referral to a physiotherapist in some cases. The index treatment consisted of eight, one-hour sessions of stretching exercises, low impact aerobic exercises, and strengthening exercises aimed at all the main muscle groups. The overall aim was to encourage normal movement of the spine. Moreover, the exercises were undertaken according to cognitive-behavioural principles, encouraging self-reliance, and viewing the exercise classes as steps to increasing their own levels of activity. At 6 months and 1 year after treatment, improvement in the exercise group was some 80% greater with respect to disability scores, and some 25% to 50% greater with respect to pain scores.

Reservations that might be raised about this study are that the patients treated were not greatly disabled (a mean score of 6 on the 24 point Roland Disability Scale), and their mean improvement was 3 on this scale. Moreover, the patients did not have acute back pain but pain that had persisted for more than four weeks but less than six months. Nevertheless, the authors were modest in their recommendations that their program would suit patients who are not improving at six weeks after onset of back pain. Of note, is that the program was not one of specific "therapeutic" exercises, but general exercises conducted in a cognitive-behavioural manner to encourage activity (see Chapters 12 and 13).

RECOMMENDATIONS

Therapeutic exercises are not effective and not indicated for acute low back pain (Level I evidence).

There may be grounds for using exercise as a means of maintaining mobility and avoiding a sick-role for patients, while natural history takes its course or other treatment is implemented.

A supervised program of general stretching, strengthening, and aerobic exercises, conducting in a cognitive-behavioural manner to encourage activity may be beneficial for patients who are not improving after six weeks of onset of low back pain (Level II evidence).

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Chapter 15. Drug Therapy

Drugs have been used or advocated in the treatment of acute low back pain in order to relieve pain, or to relieve muscle spasm.

Analgesics

Drugs that might be used or have been used to relieve low back pain are:

1. simple analgesics
2. compound analgesics
3. non-steroidal anti-inflammatory drugs (NSAIDs)
4. opioids.
5. antidepressants

Simple Analgesics

The use of simple analgesics presumes no particular cause or mechanism for back pain. The drug is used for its central, analgesic effects. The drug of choice is paracetamol. However, there have been no studies comparing paracetamol to placebo in the treatment of back pain. One study [1] used paracetamol as the control for diflunisal in acute low back pain. Four of 12 patients treated with paracetamol considered the efficacy of therapy to be good or excellent, but 10 of 16 patients treated with diflunisal found it to be good or excellent. This result reflects common clinical experience in that, despite recommendations to use paracetamol for acute low back pain, few patients find it satisfying, and prefer something "stronger".

Compound Analgesics

The use of compound analgesics also presumes no particular cause or mechanism for back pain. The drugs are used for their additive, central analgesic effects. They are used if simple analgesics appear to provide insufficient relief of pain.

A meta-analysis, however, (based largely on literature on oral surgery and post-operative pain), showed that codeine added only a 5% increase in pain relief to that afforded by paracetamol[2]. The addition of codeine significantly increased the risk of side effects, particularly with repeated use. There have been no controlled studies of compound analgesics in the treatment of acute or chronic back pain.

NSAIDs

NSAIDs are designed to act peripherally on sources of pain that involve inflammation. However, there is no evidence that any of the common causes of back pain involve inflammation. Therefore, there is no fundamental rationale for the use of NSAIDs in acute back pain. Such effects as might be obtained, may well result from the central analgesic effects of NSAIDs.

With respect to potency, NSAIDs offer no advantage over paracetamol in the treatment of conditions such as osteoarthritis of the knee [3]. On the other hand, NSAIDs are associated with common side effects such as gastrointestinal irritation and bleeding, and rare side effects such as deterioration of renal function. Side-effects are more prevalent, and apparently more potent in the elderly, with a risk of death, directly attributable to NSAIDs, of about one in 50,000 population per year [4,5,6].

For these reasons, there is no justification, prima facie, for prescribing NSAIDs in preference to paracetamol. Any purported advantage of the convenience of using a single, daily dose of NSAIDs over divided doses of paracetamol needs to be weighed against the greater risk of morbidity for no extra gain in analgesia.

Efficacy

There has been one Class I study of the treatment of low back pain with NSAIDs [7]. The review found that, on balance, the literature suggested that NSAIDs are effective for short-term symptomatic relief in patients with uncomplicated low back pain. They were less effective in patients with back pain and sciatica and in patients with nerve root symptoms. Five out of 10 trials that compared NSAIDs with placebo found NSAIDs to be superior. Of three studies with methodological scores greater than 50 out of 100, one found in favour of NSAIDs, one found no difference to placebo, and one found in favour of NSAIDs for patients with moderate to severe back pain, there being no difference for patients with mild pain. The studies were limited to periods of only 3 days to 14 days of treatment. No longer-term data were available. With respect to efficacy, there are no compelling data to show superiority of one NSAID over another in the treatment of back pain. As a class of drugs, NSAIDs are equal or slightly superior to paracetamol or dextropropoxyphene. Side effects of NSAIDs occurred in 0% to 31% of the patients studied.

A later systematic review from the same group [8] echoed these same conclusions. It reported that there is strong evidence that NSAIDs are more effective than placebo in patients with uncomplicated acute low back pain, but they are not more effective than analgesics.

A pragmatic review[9], found three "reasonably well-designed" studies showing the efficacy of diflunisal, naproxen and piroxicam, and recommended, *inter alia*: starting therapy with acetaminophen or generic salicylate; using high-dose, non-acetylated salicylates or generic ibuprofen, if NSAIDs are desired; avoiding more than one NSAID simultaneously; beginning with small doses and increasing only if necessary.

There is a prevailing impression in the field of chronic pain management that paracetamol should be the analgesic of first choice for low back pain of unknown origin. The attraction of the drug is that it is relatively safe, compared to other options. The preference for paracetamol, however, obtains despite the lack of explicit data that justifies the recommendations, and despite knowledge that only a small proportion of patients obtain satisfying analgesia with this drug.

The AAOS and NASS[10] recommend NSAIDs for acute low back pain, but warn of their side-effects, and comment that "there is no evidence that administration of NSAIDs are (sic) more efficacious than simple analgesics or acetaminophen..." [10].

The AAOS [11] concludes that "acetaminophen is reasonably safe and is acceptable for treating patients with acute low back problems" and "NSAIDs (including aspirin) are acceptable for treating patients with acute low back problems" [11].

The CSC and ACC [12], like the AHCPR[13] recommend that " the safest effective medication for acute low back pain appears to be acetaminophen. Non-steroidal anti-inflammatory drugs (NSAIDs) are also effective although they can cause intestinal irritation/ulceration or (less commonly) renal or allergic problems. Phenylbutazone is not recommended due to risks of bone marrow suppression. Paracetamol may be used safely in combination with NSAIDs or other pharmacological or physical therapeutics, especially in otherwise healthy patients".

Advice obtained from senior rheumatologists, for the purpose of the present Guidelines, is that if paracetamol is not providing adequate pain-relief, an NSAID should be prescribed at about the third day.

If indicated, because of age and other risk factors, protective measures, such as misoprostol [6], should be added.

Opioids

Like simple analgesics, opioids are used for their central analgesic effects, but offer greater potency. However, they also incur problems with habituation, tolerance (although not addiction in patients with pain who have no history of social drug-abuse) and side-effects such as sedation and constipation.

They are a tempting option for doctors treating patients whose back pain remains reportedly severe despite treatment with simple analgesics, NSAIDs, compound analgesics, and other measures. Their undisciplined use, however, invites serious problems associated with the side-effects and properties of these drugs. They are not recommended as a first line of management for acute back pain. If used they must be used, not sparingly, but judiciously. The assistance of an expert unit is invaluable in terms of determining appropriate doses and routes of administration, and varying agents in order to minimise tolerance and habituation. Such assistance would seem wise in the course of any long term use of opioids.

Antidepressants

Antidepressants have been used as primary agents and as co-analgesics in the treatment of a variety of pain problems, most commonly - headache, post-herpetic neuralgia, and a variety of "rheumatic" conditions. Their apparent success in general pain management spawned their use for low back pain. However, the available literature does not support their perceived or alleged value.

A systematic review[14] found the literature on antidepressants and low back pain to be poor and uncompelling for their favour. The controlled studies that have been published suffer from various deficiencies such as incomplete data and less than rigorous evaluation and follow-up of outcome; all have addressed chronic low back pain. One study indicated a superiority of imipramine over placebo, but only with respect to "number of days had to lie down" and " number of days with at least some restriction of normal activity"; there were no differences with respect to pain intensity, depression, feeling miserable, overall evaluation of symptoms and physical findings [15]. Another study showed amitriptyline to be superior to placebo, but only with respect to use of analgesics [16]. Trazadone showed no superiority over placebo [17]; nor did tofranil[18].

Muscle Relaxants

The rationale for the use of muscle relaxants is purported to be to relieve painful muscle spasm. However, there is no evidence that spasm of the back muscles is painful or contributes to the patient's pain. There is no evidence that so-called muscle spasm can be reliably diagnosed. There is no correlation between clinical muscle spasm and any biological parameter such as EMG. Indeed, eminent authorities have decried the wisdom of belief in muscle spasm[19] or lamented its lack of validity[20]. Nevertheless, the use of muscle relaxants in back pain has from time to time been explored, and remains a temptation for physicians to do something for their patients in need.

A systematic review[8] identified five high quality, placebo-controlled studies that reported better improvement in pain intensity from muscle relaxants. However, the drugs for which there is the strongest and greatest amount of evidence are ones not available in Australia (carisoprodol, cyclobenzaprine). For those that are available, the evidence is weak, or the clinical effect is limited.

For the relief of muscle spasm in patients with acute back pain, baclofen showed a statistically significant benefit over placebo at 14 days after start of treatment, but the difference was only marginally significant clinically, and was apparent only in patients with initially severe symptoms [21]. Diazepam offers no benefits over placebo [22]. Orphenadrine is ostensibly superior to phenobarbital or placebo at 48 hours after start of treatment, but is associated with side-effects in 25% of patients [23].

RECOMMENDATIONS

For the management of acute low back pain, analgesics may be used as a temporary palliative measure in conjunction with other interventions.

In the first instance, adequate and regularly scheduled doses of paracetamol should be used.

For patients for whom paracetamol provides insufficient relief of pain, an NSAID may be added on the third day of pain, with precautions being taken to observe the standard contra-indications, to monitor possible side-effects, and to institute prophylactic measure as required.

Compound analgesics should be used judiciously and with due attention to the disciplined prescription of these drugs and their disciplined use by the patients.

Expert assistance is advised if the regular use of opioids is contemplated.

The use of antidepressants as analgesics or co-analgesics for back pain is not justified by the literature.

The use of muscle relaxants is not justified by the literature.

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Chapter 16. Manual Therapy

Manual therapy is perhaps the most contentious and most bitterly contested treatment for low back pain. This arises because manual therapy is the principal therapeutic tool of several craft-groups. Manipulation is the hallmark of chiropractic therapy. It is the hallmark of certain groups within Physiotherapy and in Musculoskeletal Medicine. Within each group there is a strong tradition of using manual therapy, and of belief in its efficacy. Each group is therefore, sensitive to any suggestion that manual therapy may not work as well as it is professed to do.

Although manual therapy may include a variety of techniques and procedures, the two cardinal categories are manipulation and mobilisation, and these have been the ones most commonly and most extensively evaluated in the literature. Even so, the definition of each type of therapy lacks consensus. In essence, however,

> manipulation involves the sudden application of a single, forceful thrust to a region of the spine, ostensibly to a selected joint or joints in that region;

whereas

> mobilisation involves the systematic application of forces of progressively increasing magnitude, to a region of the spine, ostensibly to a selected joint or joints in that region.

These definitions describe, and are based on, what the therapist does. Other definitions based on what they believe they achieve, are not acceptable - such "taking the joint beyond its physiological range of movement", or "within the joint's normal range of movement". These may be the intentions or the perceptions of the manipulative therapist, but there is no evidence on what constitutes the normal range of passive movement of spinal joints and whether particular techniques exceed these or not.

Efficacy

It has been found that the number of reviews of manipulation for back pain now exceed the number of original controlled trials [1]. Moreover, it has been found that the conclusions of pragmatic reviews are a function of the discipline of the author of the review[1]. For that reason, it should be that only blinded, systematic reviews should be entertained as constituting Level I evidence in this arena.

Several systematic reviews have appeared in recent years, each differing somewhat in their conclusions, but differing also in the literature surveyed. Thus, earlier reviews covered only the literature to date, whereas subsequent reviews covered literature published since the earlier reviews. Some reviews elected to cover only selected literature.

The first major systematic review (1991) [2] commented on the general poor quality of the literature, and concluded, “so far the efficacy of manipulation has not been convincingly shown” [2].

The second systematic review (1992) [3] offered a statistical pooling of available results, and was more liberal in its conclusions. It found that, on the average, lumbar spinal manipulation for acute low back pain, offered a 17% greater chance of more rapid recovery than usual.

The third review(1996) [4] updated the previous two on the basis of eight new studies. It identified studies of manipulation for acute back pain, subacute back pain, chronic back pain, and for sciatica. For acute back pain it found that manipulation was not consistently better than short wave diathermy, massage, exercises or analgesics. Of the nine studies scoring low on methodology, four found no significant superiority of manipulation over control; two found advantages but either only in a sub-group identified *post hoc* or in only terms of recovery for a greater proportion of patients at two weeks. Of the three studies scoring highest on methodology, none found manipulation to be superior. The review concluded "We could not find evidence in favour of manipulation in patients with acute low back pain" [4]. The authors explained their difference in conclusion from that of Shekelle [3] on the basis of having included a greater number of trials.

One review (1996)[5] focussed explicitly on the efficacy of chiropractic manipulation for back pain. It found that the literature "did not provide convincing evidence for the effectiveness of chiropractic for acute or chronic low back pain" [5].

The most recent review [6] identified one high quality and 14 low quality trials. Three of four low quality trials reported a positive result compared with placebo. Of 14 trials that compared manipulation with other conservative types of treatment, ten were positive in favour of manipulation, whereas four (including the one high quality trial) were negative. The authors concluded that "there is limited evidence that manipulation is more effective than a placebo treatment", but "there is no evidence that manipulation is more effective than (other) physiotherapeutic applications (massage, shortwave diathermy, exercises) or drug therapy (analgesics, NSAIDs) for acute low back pain, because of the contradictory results." [6].

The results of controlled trials and systematic reviews thereof stand in contrast to the recommendation of manipulative therapy by expert panels in the past [7,8]. These recommendations seem to be based less on an analysis of the literature and more on socially based consensus.

Level II Evidence

A recent, high quality study [9], not covered by any systematic reviews to date, provides further evidence. That study [9] compared physical therapy, chiropractic manipulation, and the provision of an educational booklet. Outcomes were evaluated in terms of pain scores, disability, days spent in bed, off work, or away from school, and use of health care. Patients were assessed at 4 and 12 weeks after treatment. No significant differences in any outcome variable were detected, but the provision of a booklet was considerably less expensive. Accordingly, the authors concluded "Given the limited benefits and high costs, it seems unwise to refer all patients with low back pain for chiropractic or McKenzie therapy" [9].

Another recent study [10] compared the efficacy of osteopathic manual therapy with that of standard medical treatment, for patients who had back pain for at least three weeks but not longer than six months. The primary outcome measure used were pain scores, disability scores, and range of motion. At 12 weeks, there were no statistically significant differences in the primary outcome measures between the two types of treatment. The osteopathic treatment group required significantly less medication, and used less physical therapy; but more than 90% of patients in both groups were satisfied with their care.

RCOMMENDATIONS

Although manual therapy appears to be more effective than placebo (weak Level I evidence),

there are no grounds to prefer manual therapy over other conservative therapy options (Level I evidence);

there are no grounds to prefer chiropractic therapy over other conservative therapy options (Level I evidence), or over providing an education booklet (Level II evidence).

there are no grounds to prefer osteopathic manual therapy over conventional medical care (Level II evidence).

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Chapter 17. Injections

Injections of local anaesthetic have been used for the relief of back pain for many years, dating back at least to 1941 [1]. There is no professed rationale for the procedure, only the empirical experience that anaesthetising areas of focal tenderness seems to help patients. There is no evidence that such areas represented sprained or injured muscles, or areas of focal spasm. The attraction of the treatment is that it is an expedient intervention that medical practitioners can offer, and it is a convenient adjunct to other interventions (see Chapter 13) that may facilitate resumption of activity.

Agents Used

No particular agent or combination of agents has been shown to be superior. Either a local anaesthetic alone or a combination of a local anaesthetic and a preparation of corticosteroid have been used. Lignocaine has been used in concentrations of 0.5%, 1% or 2%. In principle, bupivacaine 0.5% is an alternative, and offers the advantage of a longer duration of action. A local anaesthetic and corticosteroid may be mixed in equal volumes, or 2ml of corticosteroid preparation may be added to an arbitrary volume of local anaesthetic, usually in range of 2 ml to 5ml.

No particular volume has been shown to be optimum. Volumes ranging from 1 ml to 5 ml seem acceptable in principle, depending on how focal the tenderness is. Although volumes of up to 10 ml have been used, single injections in excess of 5 ml, or even in excess of 2 ml, cannot be expected to be "focal", and are inconsistent with the already fragile rationale for the procedure. The temptation to use larger volumes seems to be nothing more than a reflection of lack of confidence with either the diagnosis or the precision of injection, or loosely based on the notion that "overkill" guards against missing the target.

Efficacy

There have been no systematic reviews of focal injections of local anaesthetic in the treatment of back pain. The evidence for "focal local" is restricted to Level II and Level III.

Level II Studies

Two studies investigated the efficacy of injections for tenderness over the iliac crest (the so-called iliac crest syndrome: see chapter 4). The first study [2] compared injection of lignocaine with injection of normal saline, in the settings of a general practice and a Rheumatology practice. The results showed a significant difference in favour of the local anaesthetic over the saline placebo, but only 50% of patients responded; only 30% obtained more than 80% relief; and the duration of response was assessed only at day 14 after treatment. Also, the therapeutic effect occurred only in the Rheumatology setting and there was no therapeutic effect in the general practice setting.

The second study [3] compared a mixture of lignocaine and corticosteroid with normal saline in a Rheumatology practice. The results were reported as statistically significant. However, of the patients treated with the active agent, only 9 out of 14 reduced their visual analogue scale by more than 2 points out of 10, and only five of these had a final visual analogue score less than 2/10.

Another study [4,5], conducted in a primary-care setting, compared usual care with treatment consisting of manual therapy mobilisation combined with injections of corticosteroids or local anaesthetic into various regions about the pelvis. After treatment and for 8 months following, the treated patients exhibited less pain and fewer absences from work than the control patients did. As a study of manipulative therapy, this study has not rated as high quality in a systematic review [6], but largely because it treated 48 patients instead of the critical 50 patients required of the scoring system. As a study of focal local, it illustrates the potential advantage of using injections to facilitate response to other interventions.

Level III Studies

One study [7] described a cohort of 52 patients who had failed to be relieved by drugs, bed-rest, manipulation, posture advice or a lumbosacral support. Nine were completely relieved after a single injection of 1ml prednisolone and 2ml procaine into the lumbosacral multifidous muscle. Eleven were relieved by isometric flexion exercises alone. The 32 patients who failed either of these treatments were grouped with 41 previously untreated patients. Forty-two were relieved of their pain two months after treatment with a combination of injection and exercise; a further 17 were rendered symptom-free by a second injection and further exercise.

One study described 20 patients who were relieved of their back pain following one or two injections of hydrocortisone and procaine into the multifidus muscles; all were free of pain at four weeks after treatment, and reportedly none suffered a recurrence within three to six months [8].

RECOMMENDATIONS (Level II, III evidence)

Injections of local anaesthetic in focal areas of tenderness may be useful in temporarily relieving acute pain, and as an adjunct to other measures to promote activity and rehabilitation.

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Chapter 18. Workplace Intervention

The importance of workplace intervention has increasingly been recognised in the literature on back pain rehabilitation. This intervention should not be misrepresented or misconstrued as an adversarial occupational health and safety visit. Rather, it involves several overt and subtle dimensions.

Foremost, the patient's practitioner, or a surrogate representative, should become familiar with the patient's work and work environment, so that they can help the patient return to work in an informed and insightful manner.

Second, they can act as the patient's advocate to negotiate with the employer

> any amendments to the workplace specifically to prevent recurrences of accidents of the type in which the worker may have been injured;
>
> modifications to the workplace otherwise to prevent or avoid recurrences of back pain problems.
>
> mutually acceptable modified duties that allow the worker to return to work and therein feel welcome.

Thirdly, the practitioner can be seen to have been the patient's advocate. While the full implications of this dimension have never been evaluated, its power should not be underestimated, given the extent to which fear of work, and dissatisfaction with the workplace are prognostic of poor outcome (Chapters 5,6, and 10).

Efficacy

In some studies [1,2] a workplace visit seems to be an integral component of successful multidimensional rehabilitation programs. However, in these studies, the effect of the workplace visit cannot be dissected from the effect of graded activity.

One study, however, directly compared the efficacy of usual care only, clinical intervention only, occupational intervention alone, and both clinical and occupational intervention combined [3]. Adding occupational intervention resulted in reduced absence from work, faster return to work, less disability, less sickness impact, and reduced pain. The effects were greater, and statistically significant when clinical intervention was combined with occupational intervention, than when occupational intervention or clinical interventions were used in isolation.

The occupational intervention was undertaken after the worker had been absent from work for six weeks, and consisted of a visit by an occupational physician and an ergonomist. The physician would recommend investigations or treatment, or could try to set up light duties that enabled the patient to return to work. The ergonomic intervention involved union and employer representatives in determining the need for job modifications. For each patient, a group was formed that included the ergonomist, the injured worker, the worker's supervisor, and representatives of management and unions. After observation of the worker's task, a meeting of the group allowed for a specific ergonomic diagnosis, and precise solutions to improve the worksite were submitted to the employer. These were designed to enable the stable return of the worker to the worksite.

The literature on what constitutes optimal workplace intervention is varied in quality but abundant. A pragmatic review[4] emphasised the virtue and importance of modified duties (as opposed to so-called light duties). Such duties consist of appropriately modified work according to the injured worker's physical capacity, developed in the context of sympathetic communication with the worker, and non-adversarial handling of the worker's compensation claim. Moreover, it is recommended that a supportive workplace response to injury needs to start when the pain is first reported, and that an individualised and accommodative approach to return to work should follow promptly [4]. Such measures can reduce both the incidence and the duration of disability resulting in time lost from work by up to 50% [4].

RECOMMENDATIONS

For injured workers with acute low back pain, a workplace visit and appropriate intervention as indicated should be an integral part of medical management. (Level II evidence)

Workplace intervention should involve the worker, their medical and union representatives (if available), and the employer, and be designed to accommodate a prompt return to work.

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Chapter 19. Behavioural Therapy

Anxiety and depression are classical psychological symptoms that are commonly, if not regularly, associated with back pain. However, they are features secondary to pain [1]. They arise early in the evolution of back pain, being established during the acute phase; and persist at similar levels, without deterioration, into the chronic phase [2]. However, rather than anxiety and depression, frustration is the cardinal psychological distress reported by patients with acute low back pain [2].

While there may be merit in recognising anxiety and depression as symptoms secondary to pain, and treating them in parallel with the pain, no studies have reported outcomes in controlled trials for specific, targeted therapy for anxiety and/or depression in patients with acute back pain.

The typical evolution of psychological symptoms in back pain is that anxiety, depression and subjective, behavioural and cognitive responses occur within the first three months, after which they stabilise [3]. However, what continues to deteriorate is disability [3].

The fashion for behavioural treatment of low back pain stems from two sources. One is the experience of Pain Clinics that have used behavioural therapy for chronic pain of various types [4]. The second drive stems from the recognition of the relationship between disability and psychosocial factors. In one form or another the Fear-Avoidance model (Chapter 6) has been used to explain the psychological basis for disability following back pain. Furthermore, the model predicts that behavioural therapy should reduce this disability (Chapter 6).

Two main types of behavioural therapy have been used for back pain - operant conditioning and cognitive therapy. At times, therapists have used a combination of both.

Operant Conditioning

Operant conditioning addresses maladaptive behaviours. It aims to reduce or eliminate pain behaviours, and to restore well behaviours. This is achieved by changing reinforcement patterns [4]. Attention is given for health-related activity; inattention for pain behaviours.

Part of the process is time-contingent prescription of medication, exercises and rest, as opposed to pain-contingent use. Medications are permitted at regular but set times, but not on demand (Chapter 15). Exercise targets are set and must be met. Rest and attention are used to reinforce meeting exercise targets; but are withheld for failure to meet the quota [4] (see Chapters 14 and 23). Graphs and records are maintained to provide patients with feedback on progress. The spouse and family members are also trained to be aware of how they reinforce pain behaviours, and in how to reinforce well behaviours.

Cognitive Therapy

Cognitive therapy addresses how patients cope with their pain. Coping involves both what a person does and what they think and say to themselves [2]. Although there are many variants of cognitive therapy, they have in common:

- the assumption that an individual's feelings and behaviours are influenced greatly by his or her thoughts;
- the use of structured techniques to help patients identify, monitor, and change maladaptive thoughts, feelings, and behaviours; and
- an emphasis on teaching skills that patients can apply to a wide variety of problems [5].

Three basic phases of cognitive therapy have been identified [4].

1. Patients are taught to reconceptualise pain by emphasising how pain can be controlled through thoughts, feelings, and beliefs. The patient is taught to modify their appraisal of their environment and to manage stress more effectively. To this end, the patient must not only know what to do but also must believe that they are capable of applying the necessary skills. A person's belief in their own effectiveness will determine whether they will try to cope, or they will avoid situations that they view as beyond their capability.
2. Patients are taught skills such as relaxation, use of imagery, and attention diversion that they can use to cope with exacerbations of their pain, or the day to day pain itself.
3. Patients are trained to practice and consolidate what is taught, with special attention to situations that could lead to relapse.

Efficacy

Despite its popularity, few controlled studies have vindicated the enthusiasm and conviction that accompanies behavioural therapy for acute low back pain. Such evidence that does obtain pertains largely to the treatment of chronic low back pain and other chronic pain problems.

Level I Evidence

Recent systematic reviews (both from the same group)[5,6] considered the efficacy of behavioural therapy for a variety of chronic pain problems. Although guarded, the conclusions were in support of behavioural therapy. Much of the positive literature, however, pertained to conditions other than back pain, such as arthritis, and upper limb pain. Much of the literature on chronic low back pain compared behavioural therapy only with waiting list controls.

One systematic review [7] addressed the efficacy of behavioural therapy explicitly for chronic low back pain. Although some other literature was cited and described, the meta-analysis provided exclusively analysed the author's own studies. Although effects were statistically significant for the treatments studied, few studies were properly controlled. The review concluded that "In this meta-analysis, cognitive-behavioural treatments were not found to differ significantly from other active treatments post-treatment or at follow-up evaluation on measures of pain, pain behaviour, functional disability, and depression, although there was a trend toward a statistically significant post-treatment effect size in favour of cognitive-behavioural therapy on the Sickness Impact Profile." [7].

Essentially this review indicated that the practice of cognitive-behavioural therapy for chronic low back pain was sustained on the basis of a trend towards statistical significance, in only one outcome measure.

With respect to acute low back pain, a systematic review[8] found that there is no evidence on the effectiveness of behaviour therapy for acute low back pain.

Level II Evidence

With respect to chronic back pain, only two studies [9,10] compared behavioural therapy with physiotherapy and an attention control. These two studies differed in the actual combinations of treatments compared, and the outcome measures in which statistically significant differences were found, but in general they found that behavioural therapy offered significantly greater improvements in scores on the Sickness Impact Profile, coping strategies, and pain beliefs. Improvements in pain, depression and other parameters were either lacking or inconsistent over time, or between studies.

In a comparative study, Altmaier et al[11] compared a standard physical rehabilitation program with the same program combined with psychological therapy consisting of operant condition, cognitive-behavioural therapy and relaxation. With respect to functional aerobic impairment, self-efficacy, self-control, disability, return to work, pain intensity, and pain interference, there were no differences between the groups.

For acute low back pain, there have been only two controlled trials of behavioural therapy. The earlier study [12] is promoted as the definitive study of operant conditioning for acute low back pain. The Methods section of the report, however, reveals that it was not a study of operant conditioning in that neither of the study groups underwent changes in reinforcement. Rather, it was a study of the merits of time-contingent versus pain-contingent prescription of analgesic, exercises, and activity limits. No differences were found at 6 weeks after treatment, but differences emerged at 12 months. The patients treated by time-contingent strategies fared significantly better with respect to health care utilisation, claimed impairment, pain drawings, and being overall well, but not with respect to vocational status or activity level. The improvements, however, were modest - ranging between 22% and 35%, on average.

A more recent study [13] compared combinations of two approaches and two interventions. Patients were either allowed to "let pain be their guide" or to follow a graded, gradual reactivation program. Each group further received either behavioural counselling limited to explanations of how the rehabilitation process was to be applied to their particular lives, or control counselling which was a non-directive discussion. There were no significant differences between groups with respect to any outcome measure at 6 months.

Opinions

Despite the lack of compelling, positive evidence for efficacy in acute low back pain, authorities still recommend early behavioural intervention for acute back pain, particularly for patients who exhibit psychosocial prognostic factors [14]. In this regard, there is no definitive, formal prescription that a medical practitioner can offer for a patient with psychosocial yellow flags (Chapter 10); no form of intervention has been tested, let alone validated.

Each patient will have his or her own, individual cluster of features; each will have a unique psychosocial and occupational environment. Accordingly, practitioners wishing to engage in psychosocial management will need to develop a unique plan tailored to the patient and their problems. For this purpose, the New Zealand Guidelines [15] recommend a governing principle to the effect that:

> *"what can be done to help this person experience less distress and disability?"*

The specific management of yellow flags is essentially consultative. Unproven, but putatively efficacious, interventions [15] require the doctor to

- regularly review the patient's progress
- acknowledge any difficulties the patient has in maintaining activity of daily living and in resuming work
- be encouraging and helpful in these respects
- maintain positive cooperation between the patient and their employer
- explain that having more time off work will reduce the likelihood of successful return to work
- promote self-management and self-responsibility
- provide incentives and feedback

To this list may be added ergonomic advice that enables the patient to undertake, or persevere with, activities in a manner that does not aggravate their pain, but for which the patient's native approach is inappropriate or counter-productive; i.e. new or better ways of doing things when the old ways seem to threaten aggravation of pain.

When patients have not responded earlier to explanation and encouragement, the practitioner should investigate why they have not understood or not complied, and devise means of overcoming barriers to understanding and compliance.

If yellow flag problems persist despite intervention, early referral (before the problem becomes chronic) to a multidisciplinary pain management team may be entertained.

RECOMMENDATIONS

Because the available, published evidence either does not support or denies any demonstrable benefit, formal behavioural therapy cannot be recommended for acute back pain, other than as an experimental therapy.

On face value, however, it seems prudent that practitioners should identify and deal with any psychosocial yellow flags that may be evident.

If, nevertheless, patients do not improve or do not respond, early referral to a multidisciplinary pain management team, before the problem becomes chronic, would seem to be an appropriate action.

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Chapter 20. Patient Education

In some circles [1], Patient Education is viewed as a desirable, but neglected, component of medical management. The objective is to empower the patient by providing them with information so that they have the appropriate insight to be able to take a greater responsibility for their own care, and thereby to rely less on passive medical therapy.

In the context of low back pain, Patient Education should be distinguished from Back School (see Chapter 21). The latter is a formal, structured process of education involving classes and regular, repeated direct contact with an instructor. In contrast, Patient Education is a less structured process characterised more by the issue of printed information than the use of repeated, face-to-face classes.

Efficacy

Patient Education has been evaluated directly and indirectly in the course of studies of the management of back pain. There have been no systematic reviews of Patient Education, but several controlled studies are available.

Level II Evidence

One study compared the outcomes of four groups of patients with acute back pain attending general practices [2]. The groups were treated with (i) bed rest, exercises, and education consisting of a tape-slide presentation and a two-page printed summary, (ii) exercises and education (iii) bed rest only, and (iv) no intervention. No differences in outcome were detected between any of the groups with respect to pain or physical activities. Indeed, the impression was that exercises and education were doing more harm than good.

A study of patients with acute or chronic back pain attending general practices explicitly evaluated the issue of a 21-page booklet compared to no issue of information [3]. It found no differences with respect to absence from work, and referrals for physiotherapy, hospital care or laminectomy; but it did report a significant reduction in the number of consultations for back pain during the ensuing one year. This result has been heralded as positive in favour of the use of booklets [4], but close inspection of the data is sobering. The significant reduction was derived from a chi-squared analysis of a table listing the number of patients in each treatment group who consulted 0, 1, 2, 3, 4 and more than 4 times in the year. The difference was indeed significant but not uniform in direction. The intervention group showed a reduction of 10-30% in 0, 1, 2 and 3 consultations but an increase of 3-13% of 4 or more than 4 consultations. Thus, the reported "reduction" was modest and not uniform. Some 84% of the patients found the booklet useful, but only 68% still had a copy at one year follow-up.

A study in a Health Maintenance Organisation [5] compared usual care, an educational booklet, and the educational booklet coupled with a 15minute session with a clinic nurse. The nurse intervention resulted in higher patient satisfaction and higher perceived knowledge, but otherwise the groups did not differ with respect to worry, symptoms, functional status or health-care use at 1, 3, 7, and 52 weeks after intervention.

A study of the impact of a educational booklet addressing the behavioural differences between "confronters" and "avoiders" found significant improvements in beliefs amongst workers who did not have back pain but not amongst workers affected by back pain [6]. However, absenteeism appeared to be significantly reduced in the intervention group during the year of intervention.

While not proving the efficacy of a patient education booklet, the study of Cherkin et al [7] showed that provision of a booklet was no less effective for the management of acute low back pain than chiropractic manipulation or McKenzie therapy, and was considerably less expensive.

Despite the lack of positive evidence, guideline authorities maintain that an educational booklet is nonetheless useful in the management of acute back pain [8,9]. British authorities credit that booklets are relatively weak interventions, but are effective when they are part of an integrated package [4]. They also serve to standardise information given to patients by different physicians, and thereby reduce confusion. Booklets are perceived as a useful adjunct to the physician's messages [4].

A booklet, known as *The Back Book*, has been developed for use in the United Kingdom [10]. Preliminary studies have shown good acceptance and approval by consumers and small but significant changes in belief following its use [3]. Similar booklets are being developed for use in Australia, by the Australian Association of Musculoskeletal Medicine, and by the National Musculoskeletal Medicine Initiative. A consumer consultant is developing the latter in tandem with the present guidelines.

When education booklets are supplemented by instructional videos on back self-management and on exercises, together with four two-hour classes conducted by a lay person, patients report less disability and significantly less worry about back pain, at six and 12 months after treatment [11].

RECOMMENDATIONS

Patient education booklets are no less effective than some forms of passive intervention, and considerably less expensive. (Level II evidence).

Patient education booklets serve as a useful adjunct to a physician's care by standardising and reinforcing messages about self-rehabilitation. They may achieve increased patient satisfaction, reduced use of health care, and reduced absenteeism. (Level II evidence).

Patient education provided by a trained layperson may help patients be less worried about their back pain, and slightly less disabled. (Level II evidence).

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Chapter 21. Back School

Back School is a course of instruction aimed at providing patients with better understanding of their problems and at helping patients take responsibility for their pain, while relieving their pain and functional disability [1,2]. It involves face-to-face interaction with patients in classroom like settings.

Efficacy

The original study of Back School [1] reported significant improvements over control in only one parameter - the prevalence of sick leave longer than 21 days. Why 21 days was chosen as the critical marker was not explained. There were no differences with respect to pain or with respect to recurrences, duration of recurrences of back pain, duration of absences or the development of chronicity.

Despite these meagre results, Back School was strongly popularised [2,3,4,] and defended [5]. Subsequent studies yielded conflicting results and a mixture of confounding influences.

A pragmatic review[6], published in 1987, described 15 studies, of which those with no controls reported favourable or encouraging results, but those in which some from of control or comparison was used found no advantage for Back School.

A systematic review, published in 1994 [7], identified 15 controlled studies and found them to vary considerably in methodological quality. All but three addressed chronic back pain. The review found that the studies with higher methodological scores found positive results. However, the review did not address the clinical significance of positive results, and the scoring system for methodology was biased against negative studies. High weightings were given to sample size which is critical for a positive finding but not for negative findings for a treatment whose efficacy is only mediocre; i.e. large numbers are important to show statistical significance for a treatment that is marginally better than control, but lack of a clinically significant result can be evident in only a small study. The review ranked the original study [1] as the third strongest and positive, despite the clinically trivial statistical results (see above).

Lower scoring studies were also penalised for not having comprehensive outcome measures such as pain, global measure of improvement, functional status, spinal mobility, and return to work. Thus, studies that found no change in pain, functional status, or mobility were penalised for not also addressing return to work. Conversely, studies that explicitly looked for and found failure to return to work were penalised for not addressing pain, global measures, functional status and mobility.

Most significantly, the review did not account for significant co-intervention. Its highest ranking and positive study used not just Back School in the treatment group but also exercise, relaxation, massage, heat, electrotherapy and home exercises, whereas lower scoring studies explicitly looked at Back School as the only intervention.

A subsequent systematic review from the same group [8] was less supportive. It identified four low quality studies, and concluded, "there is no evidence that a back school is effective for acute low back pain, because of contradictory results" [8].

One study not covered by that review provides evidence against back school. A study of workers [9] showed that adding Back School of three 90 minute classes to standard care offered no significant advantage in terms of pain, disability, spinal function, return to work, absenteeism or recurrence.

A study of patients attending a general practitioner[10], treated with Back School only, exhibited similar patterns of recovery to those of patients given advice only not to strain their back, with respect to proportion of patients pain-free at 1, 3 and 6 weeks, and with respect to recurrences during the ensuing one year.

RECOMMENDATIONS

Back School cannot be recommended as a valid therapeutic option for low back pain. (Level I evidence)

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Chapter 22. Functional Restoration

Functional Restoration is a program of management of back pain, based on sports medicine principles, in which the complaint of pain is essentially disregarded, and management instead focuses on improving the patient's capacity for movement and for tasks specific to their occupation. A hallmark of the program is the use of back-testing machines to monitor objectively changes in range of movement and muscle strength, with regular provision of feedback of gains to the patient.

A typical program requires a three-week live-in period with activities for 57 hours per week, involving specific exercises, work-simulation and work-hardening, coupled with education and cognitive-behavioural training [1].

Efficacy

There have been no trials of Functional Restoration for acute low back pain. Such data as do obtain relate to chronic low back pain.

Developed in Texas as the PRIDE program, by Mayer and colleagues [1], the first results of Functional Restoration were sufficiently impressive to attract the 1985 Volvo Award for back pain research [1]. The program achieved an 86% return to work, and a reduction in surgery rates and consumption of health-care. A two-year follow-up confirmed that 86% of patients had remained at work [2]. These results were subsequently replicated by independent investigators [3,4], and Functional Restoration has attracted considerable endorsement, at least in the United States [5].

However, conspicuous in the all the United States studies was the use of a peculiar control group. In all studies, the control groups were patients who were denied entry into the treatment program either by their physicians or by their insurance companies. This does not constitute a valid control group because these patients were selected out on social and economic criteria that could have a bearing on outcome [6]. Furthermore, the very act of denial of therapy could be suspected as itself having a deleterious effect on prognosis.

Studies that have used better control groups have not borne out the success rates of the United States studies, and have shown no difference to control therapy.

A Canadian study [7] compared Functional Restoration with a control group who underwent "usual care", and found an 80% return to work rate for both groups. There were no significant differences in days lost from work, number of claims, wages lost, or cost of claims. There was a significant difference in that Functional Restoration cost more than "usual care".

A Finnish study [8] compared Functional Restoration with light and unspecific exercises. The males but not the females in the Functional Restoration group achieved significantly better improvement in flexibility and performance capacity. Their pain and disability although significantly less statistically, was less only to a clinically trivial degree. There were no differences in psychological status, sick leave, retirement, and use of health-care or endurance.

Two conclusions obtain. First, when comparable control groups are used, Functional Restoration is not noticeably superior. Second, Functional Restoration appears not to work as well outside the United States.

With respect to the latter, the Finnish investigators [8] concluded that perhaps the difference in social structure bears on the success of Functional Restoration, or lack thereof. In Finland, patients have the security of a disability pension if they remain with back pain that is more generous than that available in the United States. Consequently, it may be that in the United States there is a stronger incentive to recover or conversely, in socialised medical systems there is a disincentive to respond to Functional Restoration.

It is also clear that Functional Restoration makes no difference to the patient's pain. Indeed, it premeditatedly avoids addressing pain; its goal is physical improvement and return to work (essentially regardless or despite pain). The United States studies certainly achieve this, but so do the Canadian [7] studies and Finnish [8] studies regardless of whether Functional Restoration is used or "usual care" or "unspecific, light exercises". This observation becomes critical when the cost of Functional Restoration comes to be considered.

Untested is which of the components of Functional Restoration are the critical ingredients [6]. Functional Restoration involves conditioning, feedback, machines, and cognitive therapy, as well as enthusiasm of the therapists. One controlled study [9] has shown no difference in outcome if patients are trained using back-testing machines or without the benefit of machines. Therefore, the active ingredient must lie elsewhere.

A formal review of Functional Restoration [10] identified these and other deficiencies in the literature. It recommended some possible designs of trials, and concluded that "until such trials are completed and reported, (functional restoration) will continue to be an attractive concept that lacks the required evidence to recommend it as a useful form of treatment" [10]. This review was met with some opposition [11], but the authors remained firm in their call for evidence [12].

RECOMMENDATIONS

There is no evidence of efficacy of so-called Functional Restoration programs for acute low back pain.

Even for chronic low back pain, Functional Restoration offers no advantage over usual care. (Level II evidence)

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Chapter 23. Graded Activity Programs

A particular type of intervention for the management of subacute low back pain has been popularised in Sweden. It involves

- measurements of functional capacity, mobility, fitness and strength;
- graded exercises, prescribed and supervised by a physical therapist, in accordance with the patient's capacity and personal work demands, undertaken in an operant conditioning manner i.e. rewarding and praising progress and gains;
- a workplace visit; and
- Back School.

Although similar in some respects to Functional Restoration, a graded activity program differs in not relying on machines to measure functional capacity; relying on a single therapist instead of a team; and not including formal psychological intervention. It is essentially a simplified functional restoration program.

Graded activity has been assessed in a single randomized, controlled study, with different aspects having been reported in different publications [1,2]. At one year after treatment, when compared with those treated under usual care, patients treated with graded activity exhibited greater spinal mobility, greater strength and greater fitness; they returned to work some five weeks sooner, and spent eight weeks less per year on sick leave [1]. Their average pain scores and pain behaviours were not different to those of patients treated under usual care, but they were subjectively less disabled, and a smaller proportion of patients (53% vs 80%) still complained of pain [2].

Although positive, these results are limited. The principal outcomes were that treated patients were somewhat fitter, stronger, and more mobile. Although they returned to work sooner, and reported less sick leave, similar if not better results have been achieved through confident reassurance and a home rehabilitation program (see Chapter 13).

Any efficacy of graded activity seems to be pertinent to subacute back pain. When similar programs have been applied to patients with acute low back pain, the results achieved are no better than those achieved by usual care [3].

RECOMMENDATIONS

For patients with subacute back pain, a graded activity program under operant conditioning, coupled with a workplace visit may assist patients to return to work in a fitter and less disabled state. (Level II evidence)

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Chapter 24. Acupuncture

Acupuncture is a politically delicate issue. Not only is it promoted as a singular therapy both within medicine and by lay groups, it is a complimentary medical practice identified with particular ethnic groups and philosophies. Any challenge to the purported efficacy of acupuncture, therefore, is easily converted into an assault on rights of practice, philosophies, and ethnic minorities.

Efficacy

Three systematic reviews provide an appraisal of the efficacy of acupuncture for low back pain.

The first [1] addressed the efficacy of acupuncture explicitly for chronic pain in a general sense. It is included here only by way of reference. It found that the quality of even the better studies was mediocre; and that the results from the better studies were highly contradictory. It concluded that the efficacy of acupuncture in the treatment of chronic pain remains doubtful.

The second review[2] offered no report with respect to acute low back pain. For chronic low back pain it concluded that because of contradictory results, there is no evidence that acupuncture is an effective treatment for chronic low back pain.

The most recent review[3] found nine studies on chronic back pain, and three on acute back pain. It found that although acupuncture was shown to be superior to various control interventions, there was insufficient evidence to state whether it is superior to placebo. The three studies of acute low back pain offered immediate results only, and no follow-up. Although marginally significant differences were reported, the confidence intervals of the odds ratios in favour of acupuncture in these studies intersected the critical value of 1.

RECOMMENDATIONS

There is insufficient evidence to recommend acupuncture as a sole or primary intervention for acute low back pain (Level I evidence).

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Chapter 25. Corsets and Orthoses

Corsets and similar orthoses have been an arcane but traditional intervention for low back pain. They are not effective, beyond perhaps a symbolic or placebo effect.

A systematic review[1] was somewhat encouraging in its conclusions, reporting that "the efficacy of orthoses for treating low-back pain remains controversial, although there are some promising results in the literature. Closer examination of the literature reveals that of three trials that included patients with acute low back pain, two found negative results. The one positive study reported that patients who wore orthoses improved more that patients treated with advice, in terms of speed of recovery, the number of patients improved, and the ability to work normally.

Interestingly, a later systematic review[2], involving one of the authors of the latter review, offered no comment on orthoses for acute low back pain, and reported only one study for chronic low back pain.

RECOMMENDATIONS

In the light of contradictory evidence, the use of corsets and orthoses for acute low back pain is not indicated (Level I evidence).

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Chapter 26. Traction

Traction is a traditional treatment for low back pain that has increasingly lost favour as international authorities have decried passive treatments, and pressed for activation and self-rehabilitation.

Efficacy

Level I Evidence

Paradoxically, a systematic review [1] concluded, on the basis of two low quality studies, that there is limited evidence that traction is effective for acute low back pain. Inspection of that literature, however, reveals that the patients were treated for sciatica. Moreover, one of the studies regarded as having a positive result actually found no difference with respect to relief of pain or improvement in straight-leg raising. In an earlier review[2] from the same group, that study was recorded as reporting a negative result. Most of the literature covered by the earlier review[2] addressed the use of traction for sciatica, and nearly all studies reported negative results.

Level II Evidence

A formal study reported the results at 5 weeks [3] and at three and six months [4] of patients with subacute or chronic back pain treated with traction or with sham traction. On all outcomes measured, there were no significant differences.

RECOMMENDATIONS

For lack of efficacy, traction is not indicated in the management of acute low back pain (Level II evidence).

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Chapter 27. Transcutaneous Electrical Nerve Stimulation (TENS)

Transcutaneous electrical nerve stimulation (TENS) is an attractive modality for the treatment of back pain. It involves the application to the back of electrodes driven by a battery-operated source that delivers a current whose pulse-width, frequency, and amplitude can be varied.

A systematic review[1] found only two trials of the effectiveness of TENS. It concluded that there is no evidence that TENS is an effective treatment for acute low back pain, because of the contradictory results.

The methodologically stronger of the two studies reviewed found that TENS offered no additional benefit to an exercise program alone [2].

RECOMMENDATIONS

TENS is not indicated in the management of acute low back pain (Level I evidence).

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Chapter 28. Algorithm

An algorithm suitable for the management of acute low back pain is depicted graphically in figure 28.1. It involves a series of iterative steps divided into four phases.

Phase 1: TRIAGE

In this phase, the patient's history should be obtained (Chapter 7). The patient should be assessed for a possible neurological condition or red flag condition (Chapter 7). If either of these conditions is evident or suspected, the patient should be managed accordingly; they exit the algorithm and are managed according to other guidelines.

If neurological and red flag conditions are not evident on history, the patient should be examined (Chapter 8). If examination is negative, the possibility of a red flag condition should be reconsidered, and if evident that condition should be pursued. If examination is positive, or if a red flag condition is not apparent, the patient should proceed to the next phase.

Phase 2: MANAGEMENT

The initial management of the patient can be strategically divided according to four cardinal problems [1]. The patient will typically present with some combination of the complaints:

"I hurt"
"I can't move"
"I can't work", and
"I'm scared".

In due course, each and every one of these problems should be addressed and, hopefully resolved. In the first instance, a worthy guiding principle [1] is that the patient should not leave the first consultation in the state in which they presented; some improvement in one or more of the problems should be achieved.

For the patient's complaint of pain, confidently providing a convincing explanation of the cause of their pain is critical (Chapter 13). Thereafter measures to provide relief of pain can be implemented, according to the patient's clinical features and the practitioner's preferences and skills. This may involve analgesics, injections, manual therapy or simple stretching manoeuvres (Chapters 13, 15,16, 17).

For the patient's loss of mobility, explanation is again an important intervention (Chapter 13). The importance of activity should be explained and emphasised (Chapters 12 and 13), and they should be shown how to achieve this. Even small gains in the first instance are important in securing the patient's confidence and future compliance.

If the patient believes they can't work, details about their reluctance should be explored, lest their beliefs be inappropriate or mistaken (Chapter 10). They may be afraid of recurrences of the event that precipitated their injury, but that should not be amplified to a fear of returning to work. They may be afraid of aggravation of their pain if they resume activity in their habitual manner, but there may be alternative means of acquitting that activity. The virtues of returning to work, in terms of prognosis should be explained (Chapters 12 and 18). If indicated, a visit to the workplace should be undertaken, and in an

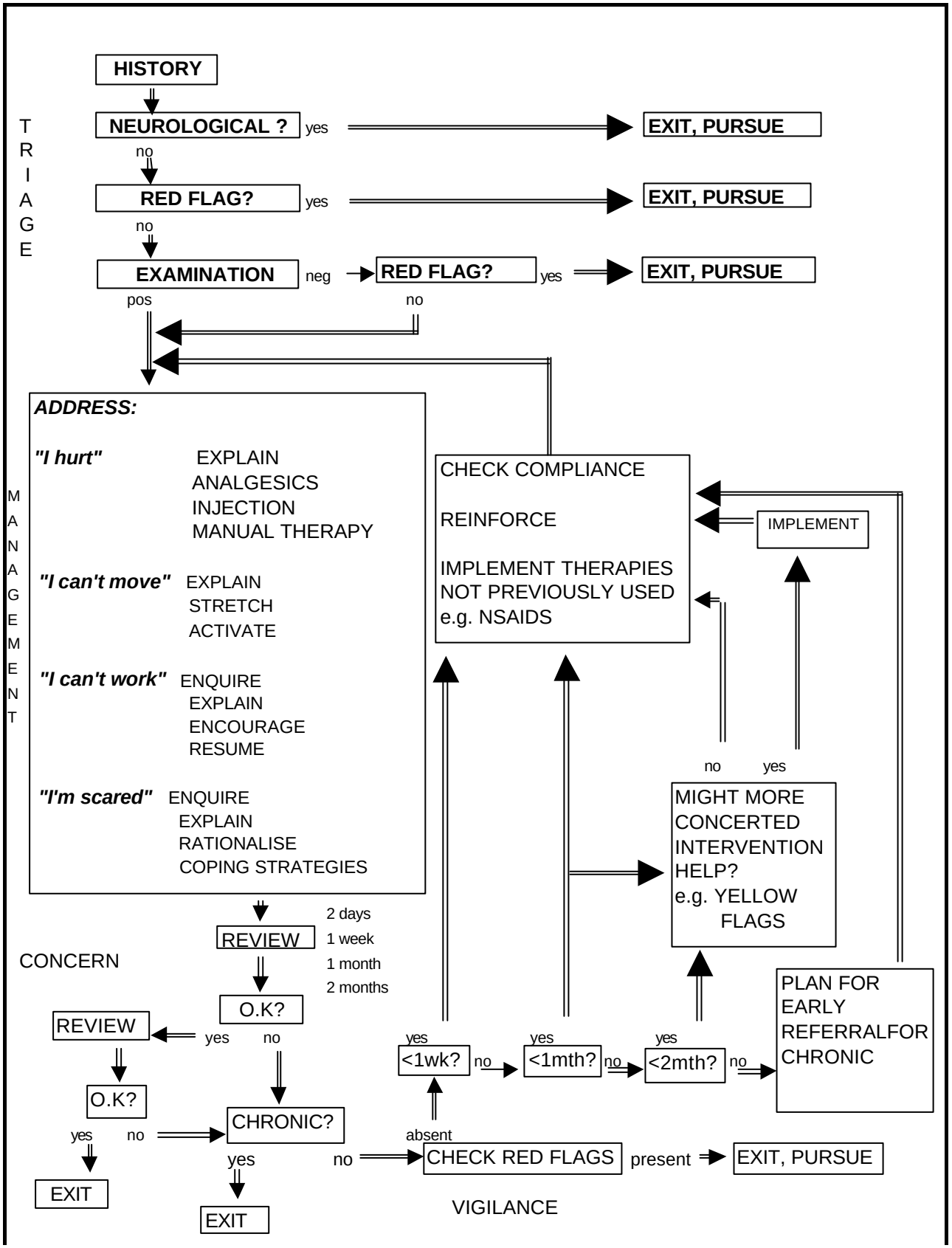

Figure 28.1. *An algorithm for the management of acute low back pain. ã National Musculoskeletal Medicine Initiative.*

for attention on subsequent visits. On those occasions, in the light of the patient's progress, further enquiry might reveal additional details.

For the management of a patient's fears, the practitioner can provide explanations but moreover, they should explore ways of providing patients with coping strategies, outlining what the patient can and might do in the face of what concerns them.

Phase 3: CONCERN

A scheduled review is a critical component of management. On the one hand, it avoids the problem of practitioners assuming that because the patient didn't come back they must have recovered (Chapter 5). On the other hand, it constitutes a worthy indication to the patient that the practitioner does indeed care about the patient. If the patient recovers, this can be achieved by no more than perhaps a telephone enquiry. Otherwise, there is merit in confirming the patient's progress by a formal consultation. Maintaining contact with the patient also offers them the opportunity to report recurrences or lack of progress, which they may be reluctant to report, out of shyness or disappointment with the practitioner's first ministrations. Depending on the patient's rate of progress, reviews can be undertaken in a matter of days, one week, or monthly.

If the patient develops a chronic problem, they will need to be managed according to protocols not covered by the present Guidelines. In the meantime, management can continue under the present Guidelines.

Phase 4: VIGILANCE

Vigilance is perhaps the most critical aspect of early management of acute low back pain. Red flag conditions may not manifest on the first day of pain, but features may emerge gradually, or at any time. For that reason the practitioner will need to remain alert to any new developments. This vigilance is more efficient and more valid than intensively investigating every patient "just in case" (Chapter 7 and 9). By and large, however, red flag conditions will not be present, but the patient may continue to suffer pain and disability. In that event, the management involves iterations of increasing complexity.

Early in the history, compliance with previous measures should be checked, and interventions reinforced, including explanation and encouragement. If indicated, other interventions, not previously used, can be implemented.

If the problems persist into the first and second month, consideration can be given for more intensive or more concerted interventions concerning yellow flags (Chapters 10 and 19), physical activity (Chapters 13, 14, and 23), and workplace intervention (Chapter 18).

If progress is being made; if the patient is improving, albeit slowly, but nonetheless positively, the protocols should be continued.

If by the second month of pain and disability, progress is not being made; attention should be paid to early institution of measures more appropriate for the management of chronic pain. There is no reason to wait for a patient technically to become chronic in a temporal sense. Indeed, valuable opportunities may be lost by waiting too long to engage expert assistance. However, on the basis of the available evidence, to date, (Chapters 13 and 18) only some 15% of patients should enter that chronic phase, if the present Guidelines are assiduously implemented during the acute phase of pain and disability.

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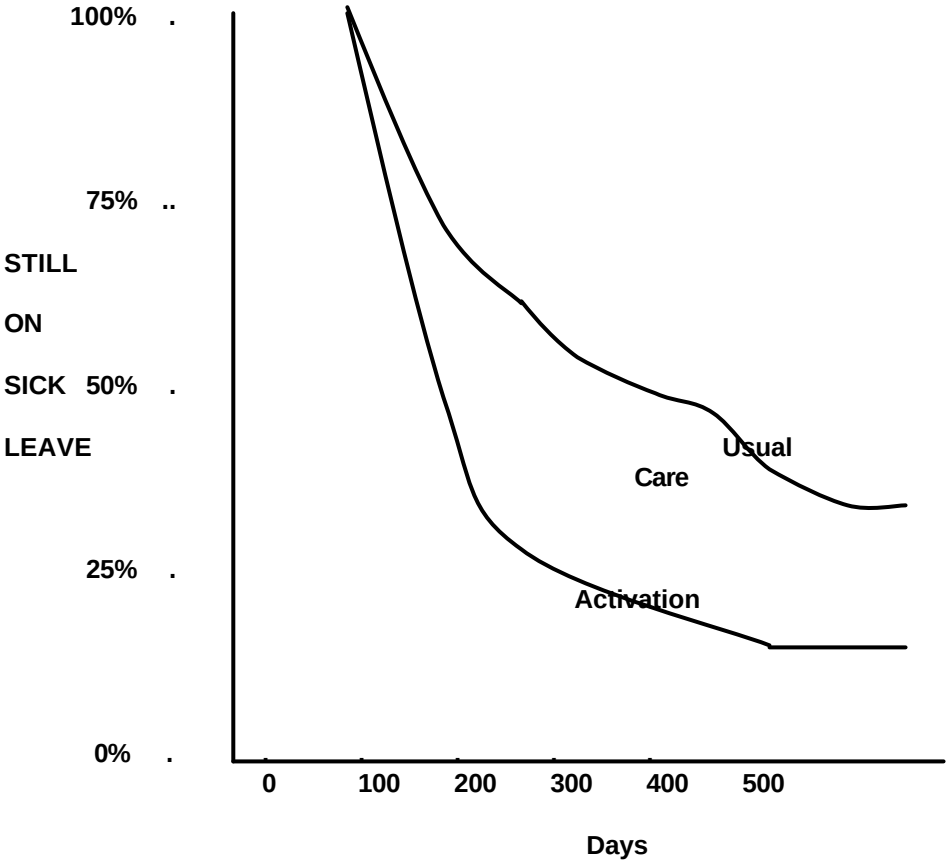

Figure 13.1. Survival curves comparing the proportion of patients still on sick-leave after treatment by activation or under usual care. Based on Indahl et al[2].