Musculoskeletal Injuries in the Workplace: Defining Quality Care

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Abstract

Quality health care for a specific medical condition may be defined as adherence to an algorithm in which decision points are based on established medical practice as supported in the literature. The decision points can be considered either a "standard of care" if there is definitive scientific evidence for their validity or a "guideline for care" if there is only a consensus of medical opinion available. Algorithms for musculoskeletal injuries can be and have been successfully applied to patients in the workers' compensation setting. They can function as a concurrent surveillance system and are well accepted by physicians, patients, and industry if implemented by unbiased medical experts. A high level of quality care is attained by following such algorithms. Other goals achieved are early functional restoration as measured by return to work, a more efficient use of diagnostic studies, and avoidance of unnecessary therapeutic interventions, with the result that treatment is more cost-effective. Such a program that strives for high-quality care and emphasizes appropriate utilization will realize cost savings that may be far greater and longer lasting than the financial saving seen with arbitrary spending caps and fee controls.

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Injury to the musculoskeletal system is a common occurrence. Besides the pain and suffering, these injuries pose a major economic problem in all industrialized nations. In 1988 alone, an estimated $126 billion was expended in the United States because of these afflictions. When the injury occurs in the workplace (hence involving workers' compensation), the problem is compounded. Added to the difficulty of handling the medical condition is the possibility that there may be a financial disincentive for the patient to recover and there is little reward for the physician to minimize disability. This compensation system has resulted in a chaotic health care environment in which diagnostic criteria and treatment regimens are extremely variable. Recovery is often dependent on emotional pressures dictated by the legal system, the patient's own motivation, the issue of secondary gain, and the physician's understandable need not to alienate the patient.

Ideally, every physician wants to deliver consistent high-quality health care, taking into account cost-control strategies for each patient. To achieve this elusive goal, a standardized protocol for the diagnosis and treatment of the various musculoskeletal injuries is helpful. Unfortunately, universally accepted diagnostic and treatment regimens rarely exist. Currently, each physician is allowed to formulate protocols based on a personalized interpretation of the available scientific evidence. This has resulted in inconsistent care, which may even vary from patient to patient in the same doctor's office.

Additionally, there is not even a consensus among physicians on what quality care means. With today's focus by all segments of society on high-quality, cost-conscious health care, we must carefully scrutinize our diagnostic and therapeutic protocols for scientific accuracy and develop delivery systems that result in a higher degree of consistent care. This approach is particularly important in the setting of workers' compensation, where inconsistent care can lead to increased disability and a substantial increase in cost.

In this article, we will first review a number of common objectives each physician should keep in mind when treating a workers' compensation patient. Next, the varied dimen-

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sions of the concept of quality care will be explored. Finally, the conceptual development of an algorithm will be presented, as well as its prospective application to an industrial population.

Goals of Patient Care

Each patient's particular health condition has an associated set of unique circumstances. There are, however, a number of common objectives that are of paramount importance for the patient and the physician to keep in mind.

The first, and most crucial, goal facing the physician is the prompt return of the patient to normal function, including the capacity to work. Unfortunately, total relief of pain is not always achieved. Patients with residual symptoms must be encouraged to return to as much activity as possible. Patient education is germane to this goal. Patients are often left with a chronic condition that causes some degree of discomfort but does not preclude them from holding a productive job. Many will then refrain from work, recreation, or household chores simply because increased activity produces mild pain. From their perspective, any discomfort is a signal that further damage is being caused to the injured area. Most of these patients need to be reassured that they are doing themselves no harm. In many cases, this information alone will allow them to function and may prevent psychological impairment as well.

The second goal is the efficient and precise use of diagnostic studies. With the availability of computed tomography (CT), magnetic resonance (MR) imaging, and other specialized tests, the physician often must resist the impulse to utilize every modality currently available and to meet the often insistent demands of the patient for the latest study. There is a proper time and indication for each of these diagnostic measures. Indeed, the decision-making process can actually be made more difficult and less efficient when too much data is made available too early in the treatment process. For example, a premature MR imaging study of a patient with nonspecific low back pain may depict lumbar disk herniation. However, this highly sensitive imaging modality shows that finding in 30% to 50% of persons who have never experienced back pain. Thus, the imaging study could lead to the erroneous conclusion that the patient's symptoms are related to a finding of no clinical significance.

The third goal is to avoid inappropriate therapeutic measures, particularly those that are invasive. Unnecessary or premature surgical intervention is not useful for attaining the desired goals, and can be a significant problem for the surgeon, the patient, and society, which ultimately bears the cost. It cannot be overemphasized that objective criteria for surgery must be satisfied. There is an optimal time for each invasive intervention, and this must be clearly defined.

The final objective should be to devise diagnostic and treatment formats that will make appropriate care available at an acceptable cost to society. This is increasingly becoming an issue, especially for musculoskeletal injuries, which have an enormous economic impact. The treating physician must be certain that costly technology and surgery are necessary, are cost-effective, and have a reasonable probability of improving the patient's outcome.

Defining Quality Health Care

There is no precise definition of quality health care. Quality remains a somewhat nebulous concept—difficult to quantitatively measure[1] and meaning different things to different people. In discussing the concept with patients, we have found that for most the criteria for "quality care" are a successful outcome and a return to an entirely normal active life. They want their care carried out in the "right manner," regardless of cost. In contrast, physicians consider that quality care has been provided when an accurate diagnosis has been made and appropriate treatment has been rendered in a timely fashion.

Historically, neither the patient nor the physician has been concerned with cost-effectiveness. Additionally, the physician usually has had no widely accepted specific guidelines or standards to follow. Rather, each physician has relied on his or her training, intellectual curiosity, and honesty to keep medically current. Not surprisingly, the result has been a wide variation in care for the same pathophysiologic process.

Given that consistently high-quality care is the common goal, the difficulty lies in selecting a workable definition that can be applied to a large population of both physicians and patients. There are several components of quality care that appear to be universally accepted. First, everyone would agree that a timely diagnosis is necessary. Second, effective and cost-conscious use of diagnostic studies is required. Third, scientifically validated therapeutic interventions are called for at the appropriate time in the disease course. Finally, each disease entity should be handled in a standardized fashion, so that consistent care is rendered from patient to patient.

Bearing these components in mind, a practical mechanism for ensuring quality health care for a specific disease entity is the formulation of a diagnostic and treatment

protocol, or algorithm, in which decision points are based on established medical practice as supported in the medical literature. Once the basic algorithm has been created, it must be continually upgraded as new scientific information and patient outcome data become available. This methodology will control variability in care by setting a standard against which each physician can measure personal performance.[2] The design of the algorithm must be constantly updated on the basis of outcome feedback from practicing physicians, which leads to ongoing quality control and improvement. Such a process is fluid and adaptable and has the capacity for continuous change.

Algorithm Concepts

An algorithm can be defined as the solution of a problem in a finite number of steps. Each step represents a decision-making point. Theoretically, the creation of an algorithm for any musculoskeletal problem is straightforward. Once the specific steps have been identified for an individual disease entity, the appropriate medical literature is researched to identify the optimum pathway for each decision point. The information obtained from the literature has to be scientifically sound as to methodology, statistics, and conclusions. The resultant algorithm can then be considered a standard of diagnosis and treatment because of its basis in valid scientific investigations. It has been estimated that when this technique for algorithm formation is strictly employed for each decision point, it will appropriately direct treatment for at least 95% of a specific patient population.[3]

Unfortunately, when the orthopaedic literature is strictly reviewed for the majority of musculoskeletal diseases, solid, scientifically based information is lacking to set a standard for every decision point. There are a variety of reasons for this unhappy situation, among them (1) the difficulty of performing prospective, long-term, double-blind studies for surgical problems, particularly when there are rapidly changing technologies; and (2) the fact that patients with many musculoskeletal illnesses recover regardless of what is done. Thus, in the algorithms that currently exist, many decision points are based on only a broad consensus of practicing physicians' standards of care and on data from the literature that are not totally reliable. The alternatives for such decision points should not be considered to represent a "standard of care" (a scientifically proved decision point), but rather a "guideline" (a consensus-based decision point). It is to be hoped that as the results of current and future research become available, guidelines will be converted to standards in these algorithms.

In general, guidelines can be followed in most cases, but deviations can occur in up to 40% of patients. Use of a guideline requires the physician to constantly monitor the individual patient's progress through the protocol, and the physician must be prepared to modify the recommended care as the specific clinical setting dictates.

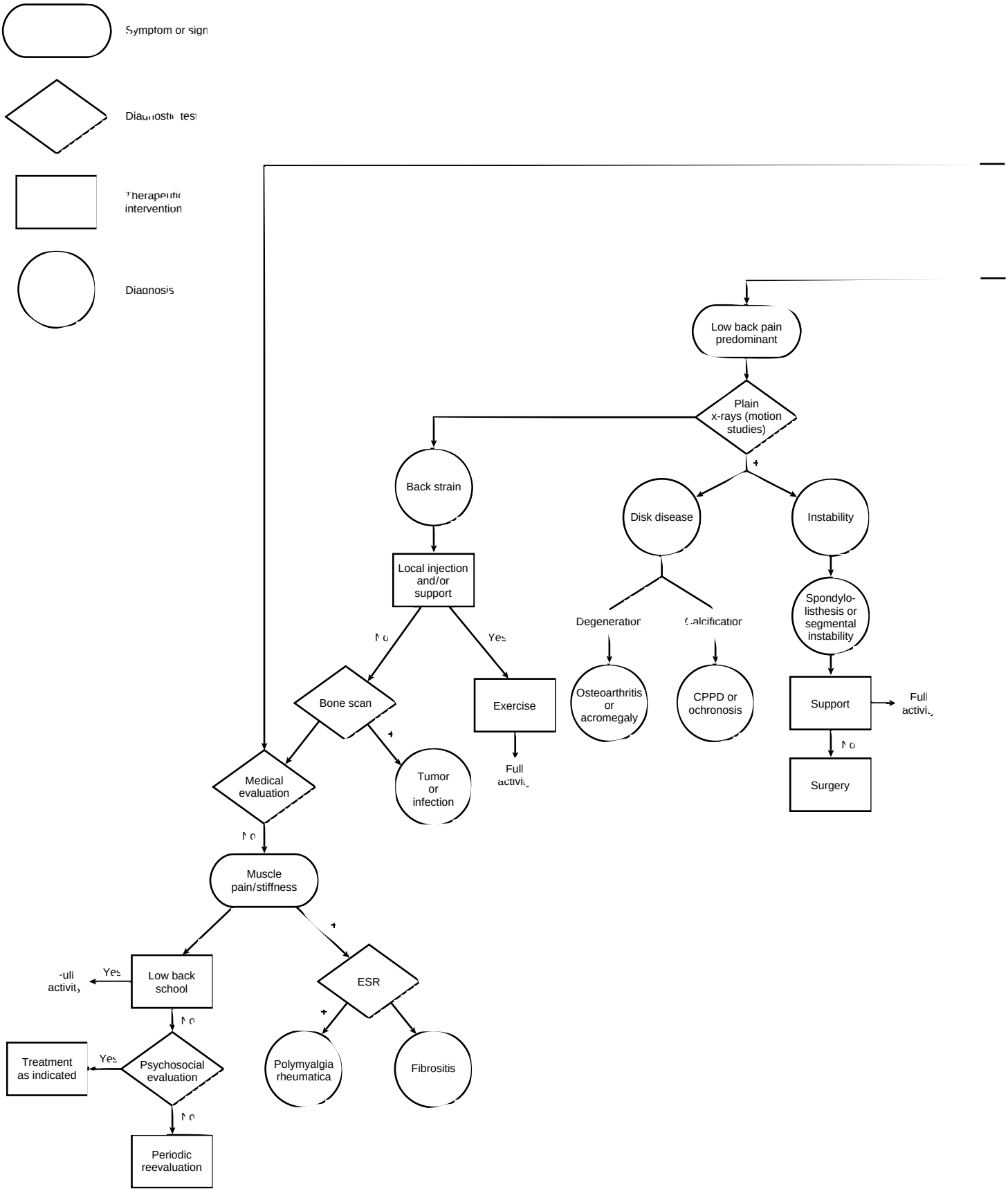
An Algorithm for Low Back Pain

Low back pain is an appropriate musculoskeletal injury to use as an illustration of the benefits of algorithm-based care, particularly when the patient has a compensable musculoskeletal condition. Low back pain injuries represent the single largest workplace problem.[4] It is estimated that the number of workdays lost per year because of this affliction is 1,400 per 1,000 workers, which represents 25% of all days lost due to disabling work-related injuries. Financially, the sum is staggering: an estimated $14 billion was spent in 1976 for the direct costs of treatment for low back pain; in 1990 that figure may have exceeded $25 billion.

Our current low back pain algorithm (Fig. 1) is driven by a patient's signs and symptoms. Patients rarely have a specific diagnosis, such as spinal stenosis, when first encountered. The problem confronting the examining physician is to integrate the patient's symptoms and physical findings and the results of appropriate diagnostic studies so as to arrive at the correct diagnosis and, on the basis of that, to formulate a logical treatment plan.

Algorithms begin with the presumption of a universe of patients who might present to a physician with a particular problem. In this example, it is low back pain. The first task incumbent on the physician is to identify any emergency condition that would necessitate immediate treatment. Cauda equina compression is the major entity demanding urgent care in patients with low back pain. If it is suspected after the history has been obtained and a physical examination has been performed, a diagnostic study should be ordered, such as MR imaging or myelography. If this confirms that cauda equina compression is present, immediate surgery is indicated. Infections and pathologic fractures requiring urgent treatment are less commonly present.

Once emergent problems have been ruled out, the rest of the protocol is directed at the systematic evaluation and treatment of other diagnostic entities, such as a herniated disk, spinal stenosis, or nonspecific back pain (often termed "back strain"). The goal of the protocol is to make the correct diagnosis using the appropriate studies in the proper time frame. The temporal sequence


Symptom or sign
Diagnostic test
Therapeutic intervention
Diagnosis
Low back pain predominant
Plain x-rays (motion studies)
Back strain
Disk disease
Instability
Local injection and/or support
Degeneration
Calcification
Spondylolisthesis or segmental instability
No
Yes
Bone scan
Exercise
Osteoarthritis or acromegaly
CPPD or ochronosis
Support
Full activity
No
Medical evaluation
Tumor or infection
Full activity
Surgery
No
Muscle pain/stiffness
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Treatment as indicated
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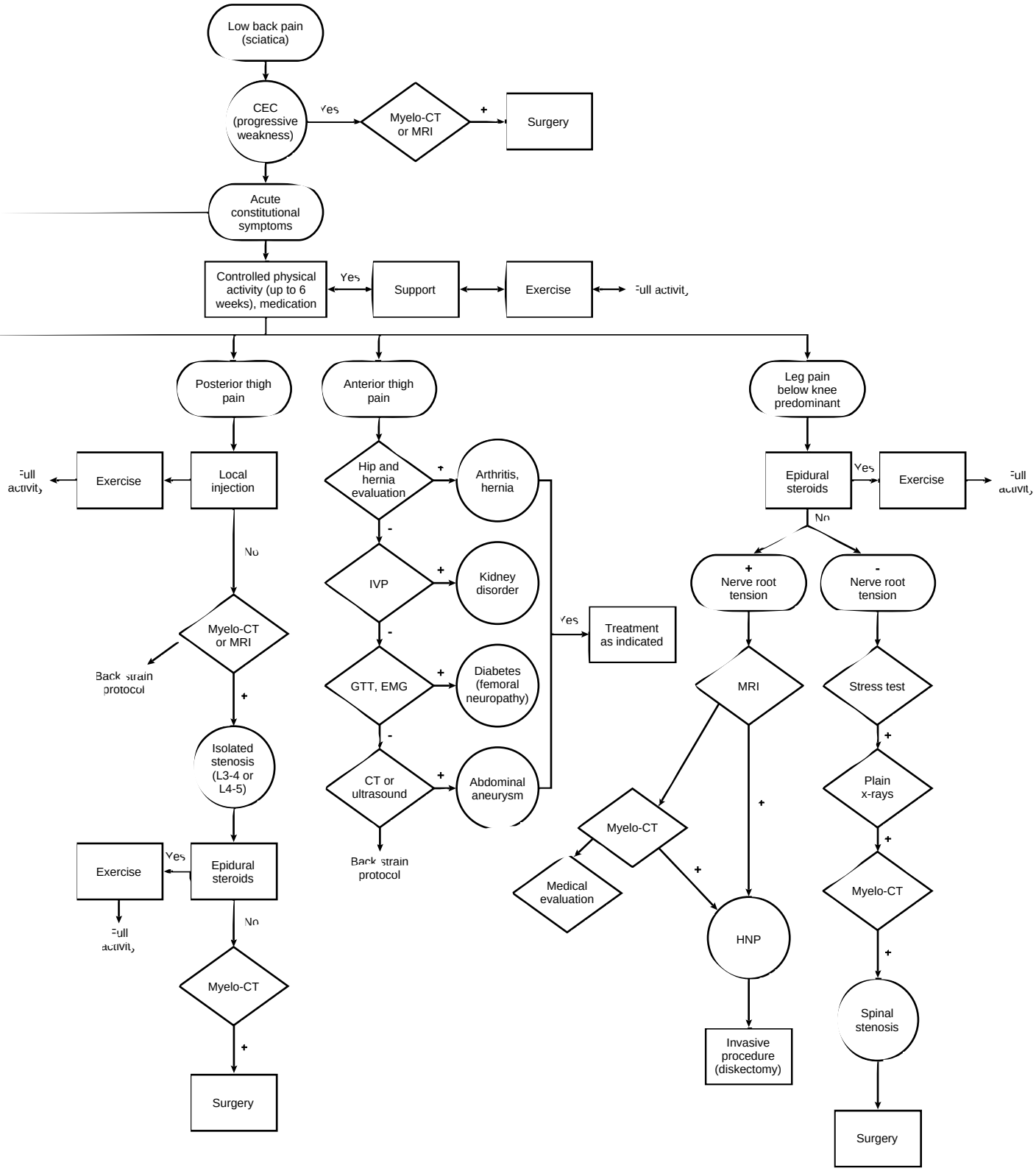

Fig. 1 Algorithm for treatment of low back pain. Abbreviations: CEC = cauda equina compression; CPPD = calcium pyrophosphate deposition disease; EMG = electromyography; ESR = erythrocyte sedimentation rate; GTT = glucose tolerance test; HNP = herniated nucleus pulposus; IVP = intravenous pyelogram; MRI = MR imaging; Myelo-CT = myelography followed by CT; Yes = relief of symptoms; No = no relief of symptoms; + = positive (abnormal findings); – = negative (normal findings).

of when to obtain a test or when to commence a treatment may be as important as the choice of the test or treatment itself. With the advent of more expensive diagnostic imaging studies, such as CT and MR imaging, appropriate indications and timing of utilization have become even more essential in patients with low back pain. The recent demonstration of significant abnormalities on the CT scans[5] and MR images[6] of 30% to 40% of asymptomatic individuals highlights the danger of utilizing these imaging modalities as a screening tool. If these studies are obtained without the proper indications, inappropriate therapeutic decisions can easily result.

A decision point is encountered whenever there is a question of obtaining a diagnostic study, instituting a treatment, or assessing the patient's ongoing condition. Some of the decision points should be considered standards of care, while others are only guidelines. For low back pain, a standard of care is surgery for the patient with a diagnosis of cauda equina compression. There is unanimity of opinion that this is the correct clinical course, and it is scientifically validated in the literature. A guideline for care would be exemplified by the treatment of herniated disks with rest and antiinflammatory medication. This treatment regimen is generally accepted by most physicians, but there is no conclusive proof of efficacy in the literature. Depending on the patient and local preferences, some physicians may well choose another form of treatment, such as hyperextension exercises. Thus, when an algorithm contains guidelines instead of standards at some of its decision points, an individual patient's care may fall outside the prescribed pathway.

Our low back pain algorithm was initially developed in the late 1970s. It has undergone continuous modification as new studies and techniques have become available. For example, the original version did not include MR imaging, which was not employed for clinical care until after 1985. Also, when the algorithm was first written, strict bed rest was considered the most fundamental conservative treatment measure and was prescribed for up to 2 weeks at a time. However, more recent investigations[7] demonstrated that bed rest for longer than 3 days offered no added benefit and indeed was counterproductive if prescribed for more than 7 days. The point is that for an algorithm to maintain its usefulness, it must be continuously updated on the basis of feedback from actual patient experience as well as technical and research advances.

Application of the Algorithm

The purpose of formulating an algorithm is to apply its standards and guidelines in a prospective manner to large populations of patients to ensure consistent and high-quality care. The algorithm is compared to the treating physician's actual care plan; when a deviation occurs, an explanation is sought. Thus, a prospective surveillance or monitoring tool is available.

It is natural for some physicians to become upset when their medical decisions are monitored. Often the physician feels challenged or threatened. As physicians, we need to realize that an individual patient's care is of concern not only to us but also to employers, third-party payers, legislators, and, most important, the patient. The physician has to accept the reality of scrutiny by others with an important stake in the patient's outcome. The physician who follows an accepted algorithm or has a valid reason for a deviation from the protocol faces minimal problems. In a sense, this surveillance mechanism is simply a system of checks and balances whereby high standards of care can be ensured for all patients.

The need for a surveillance system has been especially acute in the case of industrial injuries, where the goal of quality care is sometimes blurred by a multitude of factors. Some patients and even some physicians have taken advantage of the compensation process for secondary gain. Monitoring the health care delivery system in a concurrent, prospective manner has been shown to decrease this misuse and result in an increase in the quality of care. For the majority of physicians, the implementation of a surveillance system will have little impact; in fact, there are cases in which an outside monitoring system can aid a physician dealing with a patient who has little motivation to get well. The physician can stress to the patient that he or she should be doing better and can reinforce that concern by stating that an unbiased outside system has evaluated the care received and concurs with the assessment.

We have applied a set of musculoskeletal algorithms in a prospective fashion to an industrial population[8] over a 10-year period. A public utility company with over 5,000 employees was monitored for every musculoskeletal injury that occurred. For every patient who sustained an injury, the care delivered was concurrently compared with a standardized treatment protocol. The patients were able to choose their own physicians. However, each patient was also evaluated by an unbiased orthopaedic consultant within a week of the injury and subsequently as required based on the patient's clinical course. The consultant compared the patient's actual care with the appropriate algorithm. When a deviation in care (proposed treatment plan or clinical recovery)

occurred for a specific patient, the treating physician was queried about the rationale for the care difference. When the explanation was reasonable, which was the case for the majority of patients, the care continued uninterrupted. However, when a valid explanation was not forthcoming, an independent examination was required, and an adjustment in the medical management usually resulted.

The results of this program demonstrated a long-term improvement in all the outcomes measured. Quality care was ensured with adherence to the established algorithms by unbiased physicians who could not take part in the patient's ongoing care. The number of days lost from work and the number of new injuries reported fell by 55% and 51%, respectively. The average time lost per injury dropped by 40%. The number of surgical procedures performed decreased by almost 70%, and the operative success rate increased dramatically. As an added benefit, there was a 60% reduction in expenditures for lost time and replacement wages, which resulted in a 10-year saving of over $4.1 million.[8]

The program accomplished the goals of ensuring quality care in a prospective, concurrent fashion. It also reduced unjustified lost time and compensation cost through early functional return, efficient use of diagnostic studies, and avoidance of unnecessary therapeutic modalities—confirming that high-quality medical care can lead to cost savings. Improvement in the quality and consistency of care delivered over time was ensured by minimization of variance and by continuous modification of the algorithm in response to outcome feedback.

The reasons for the success of this program are multifactorial. There was a definite positive attitude change in both the patients and the treating physicians. The patients realized that they were being closely observed (the sentinel effect) by musculoskeletal experts and knew they would not receive time off or be kept out of work for prolonged periods without legitimate medical problems. This sentinel effect probably accounted for the decreased rate of new injury. Adherence to the algorithms played a role in the decreased frequency of surgery and the earlier return to work. The treating physicians rarely felt threatened by the evaluators once they recognized their unbiased status. The rule that the evaluator could not under any circumstance become involved with the patient's ongoing treatment was of paramount importance. In fact, many treating physicians came to use the expert evaluators to reinforce their own opinions with the patients. The success of the program was sustained over the entire 10 years, and there was no rebound phenomenon (i.e., an initial change with a gradual return to the original pattern over time). This experience has convinced us that this type of program can have a lasting effect if carried out in a consistent manner.

Finally, it was a definite bonus that quality medical care saved money. At the beginning, there was some concern that higher costs would be incurred with this program. In actuality, as specific indications for the various diagnostic studies and treatment modalities were instituted, a substantial cost saving was realized. This means that other interested parties, such as legislators and employers, can focus on obtaining quality care with the likelihood that cost-effectiveness will follow.

Summary

Quality health care for specific medical entities may be defined as following an algorithm in which the decision points are based on established medical practice as supported in the literature. The decision points can be considered either a standard of care, if there is definitive scientific evidence for their validity, or a guideline for care, if only "soft" data are available. Quality care in and of itself does not necessarily lead to an excellent outcome. Quality care is a process and is ensured by minimization of variance from the process itself and by continuous monitoring of outcome feedback to update the protocol over time.

Algorithms for musculoskeletal injuries can be successfully applied to patients in the workers' compensation setting. They are a powerful instrument for effecting behavioral change. A concurrent unbiased medical surveillance system will benefit the entire health care delivery system. The goals of early functional return for patients, efficient use of diagnostic studies, avoidance of unnecessary therapeutic modalities, and cost-effective treatment can all be accomplished. We believe the cost saving realized from ensuring high-quality care with appropriate utilization may be far greater and longer lasting than the financial saving seen with arbitrary spending caps and fee controls. In the future, as "private" medical care begins to demand a similar scrutiny of its resources, this approach of comparing a patient's care to a scientifically accepted algorithm may well become the norm.

References

1. Frymoyer JW: An international challenge to the diagnosis and treatment of disorders of the lumbar spine. *Spine* 1993;18:2147-2152.
2. Juran JM: *Juran on Planning for Quality*. New York: Free Press, 1988.
3. Eddy DM: *A Manual for Assessing Health Practices & Designing Practice Policies: The Explicit Approach.* Philadelphia: American College of Physicians, 1991.
4. Frymoyer JW: Back pain and sciatica. *N Engl J Med* 1988;318:291-300.
5. Wiesel SW, Tsourmas N, Feffer HL, et al: A study of computer-assisted tomography: I. The incidence of positive CAT scans in an asymptomatic group of patients. *Spine* 1984;9:549-551.
6. Boden SD, Davis DO, Dina TS, et al: Abnormal magnetic resonance scans of the lumbar spine in asymptomatic subjects: A prospective investigation. *J Bone Joint Surg Am* 1990;72: 403-408.
7. Deyo RA, Diehl AK, Rosenthal M: How many days of bed rest for acute low back pain? A randomized clinical trial. *N Engl J Med* 1986;315:1065-1070.
8. Wiesel SW, Boden SD, Feffer HL: A quality-based protocol for the management of musculoskeletal injuries: A ten year prospective outcome study. *Clin Orthop* 1994;301:164-176.