Treatment-Based Classification System for Low Back Pain: Revision and Update

Muhammad Alrwaily, Michael Timko, Michael Schneider, Joel Stevans, Christopher Bise, Karthik Hariharan, Anthony Delitto

The treatment-based classification (TBC) system for the treatment of patients with low back pain (LBP) has been in use by clinicians since 1995. This perspective article describes how the TBC was updated by maintaining its strengths, addressing its limitations, and incorporating recent research developments. The current update of the TBC has 2 levels of triage: (1) the level of the first-contact health care provider and (2) the level of the rehabilitation provider. At the level of first-contact health care provider, the purpose of the triage is to determine whether the patient is an appropriate candidate for rehabilitation, either by ruling out serious pathologies and serious comorbidities or by determining whether the patient is appropriate for self-care management. At the level of the rehabilitation provider, the purpose of the triage is to determine the most appropriate rehabilitation approach given the patient's clinical presentation. Three rehabilitation approaches are described. A symptom modulation approach is described for patients with a recent—new or recurrent—LBP episode that has caused significant symptomatic features. A movement control approach is described for patients with moderate pain and disability status. A function optimization approach is described for patients with low pain and disability status. This perspective article emphasizes that psychological and comorbid status should be assessed and addressed in each patient. This updated TBC is linked to the American Physical Therapy Association's clinical practice guidelines for low back pain.

M. Alrwaily, PT, MS, PhD, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh, Bridgeside Point 1, 100 Technology Dr, Ste 470, Pittsburgh, PA 15219 (USA), and Department of Physical Therapy, King Fahad Specialist Hospital, Dammam, Saudi Arabia. Address all correspondence to Dr Alrwaily at: mza7@pitt.edu.

M. Timko, PT, MS, FAAOMPT, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh, and Division of Physical Therapy, School of Medicine, West Virginia University, Morgantown, West Virginia.

M. Schneider, DC, PhD, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh.

J. Stevans, DC, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh.

C. Bise, PT, MS, DPT, OCS, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh.

K. Hariharan, PT, MS, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh.

A. Delitto, PT, PhD, FAPTA, Department of Physical Therapy, School of Health and Rehabilitation Sciences, University of Pittsburgh.

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Despite the plethora of research on low back pain (LBP), clinical trials have not provided conclusive evidence supporting the superiority of any particular intervention.[1,2] This gap is often attributed to the fact that the design of most clinical trials includes delivery of a single intervention to a heterogeneous group of patients with LBP. This heterogeneity, combined with wide inclusion criteria, tends to dilute the treatment effect. In order to optimize the treatment effect, patients with LBP should be classified into homogeneous subgroups and matched to a specific treatment. Subgroup-matched treatment approaches have been shown to result in improved outcomes compared with nonmatched alternative methods.[3–6] Designing studies that incorporate subgroup-matched treatments into LBP classification systems has become a research priority.[7]

In the field of physical therapy, there are 4 primary LBP classification systems that attempt to match treatments to subgroups of patients using a clinically driven decision-making process: (1) the mechanical diagnosis and therapy classification model described by McKenzie,[8] (2) the movement system impairment syndromes model described by Sahrmann,[9] (3) the mechanism-based classification system described by O'Sullivan,[10] and (4) the treatment-based classification (TBC) system described by Delitto et al.[11] All of these systems have made significant contributions in improving clinicians' ability to recognize patterns of signs and symptoms in patients with LBP and match them with respective treatments. Yet, these systems—without exception—have 4 main shortcomings:

1. No single system is comprehensive enough in considering the various clinical presentations of patients with LBP or how to account for changes in the patient's status during an episode of care.

2. Each system has some elements that are difficult to implement clinically because they require expert understanding in order to be utilized efficiently.

3. None of these classification systems consider the possibility that some patients with LBP do not require any medical or rehabilitation intervention and are amenable for self-care management.

4. The degree to which the psychosocial factors are considered varies greatly among these systems, which runs contrary to the clinical practice guidelines established by the American Physical Therapy Association (APTA) that advocate using the biopsychosocial model as a basis for classification.[12]

These shortcomings are likely to be overcome as our understanding of the factors that drive LBP improves. We are likely to see more convergence than divergence among the 4 systems.

In this article, we focus on the TBC system described by Delitto et al.[11] The TBC is the most extensively researched classification system in the field of physical therapy, with more than 16 articles investigating its usefulness as a guide for clinical decision making.[13] Since its publication in 1995, the TBC has passed through phases of development that were largely based on emerging evidence. At each phase, the TBC had different strengths and limitations. The purpose of this article is to review those strengths and limitations and use current evidence to update the TBC approach. Specifically, the update of the TBC will take into consideration the following points:

- Recognition that the initial triage process includes all health care providers who come in first contact with patients with LBP.
- Establishing decision-making criteria for the first-contact practitioner to triage patients into 1 of 3 approaches: medical management, rehabilitation management, and self-care management (Fig. 1).
- Utilizing risk stratification and psychosocial tools to determine which patients require psychologically informed rehabilitation.
- Updating decision-making criteria for the triage process by rehabilitation providers to determine the most appropriate rehabilitation approach (Table, Fig. 1).
- Linking the components of the TBC to the APTA clinical practice guidelines for LBP.
- Proposing a course of action addressing the limitations of the previous versions of TBC, including the development of a novel neuromuscular assessment, prioritizing interventions, and identifying a research agenda.

TBC System—1995

The original TBC system was created in 1995 by a panel of experts with the purpose of describing a classification system that specifically directed conservative management to patients with LBP.[11] The 1995 TBC system was designed, in part, to be analyzed critically and serve as the basis for scientific inquiry. This system represented the initial phase of development.

The 1995 TBC system had 3 levels of classification (Fig. 2). Level 1 classified the patient into 3 groups: (1) patients who could not be managed by physical therapy and needed to be referred for medical management because of great suspicion of serious pathology, (2) patients who could be managed by physical therapy but required consultation with another health care practitioner because of presence of chronic comorbidity or "magnified illness behavior," and (3) patients who could be independently managed by physical therapy.

Level 2 was for patients deemed appropriate for independent physical therapy. Level 2 classified such patients into 3 stages, each of which had specific interventions that were appropriate for the patient's status. Stage I was for patients with severe pain and disability status; the goal of the intervention was symptom modulation. Stage II was for patients whose pain was not too severe but interfered with their activities of daily living; the goals of the treatment were resolution of residual symptoms and improvement of physical function to enhance the performance of activities of daily living. Stage III was for patients who were relatively asymptomatic and could perform standard activities of daily living, but
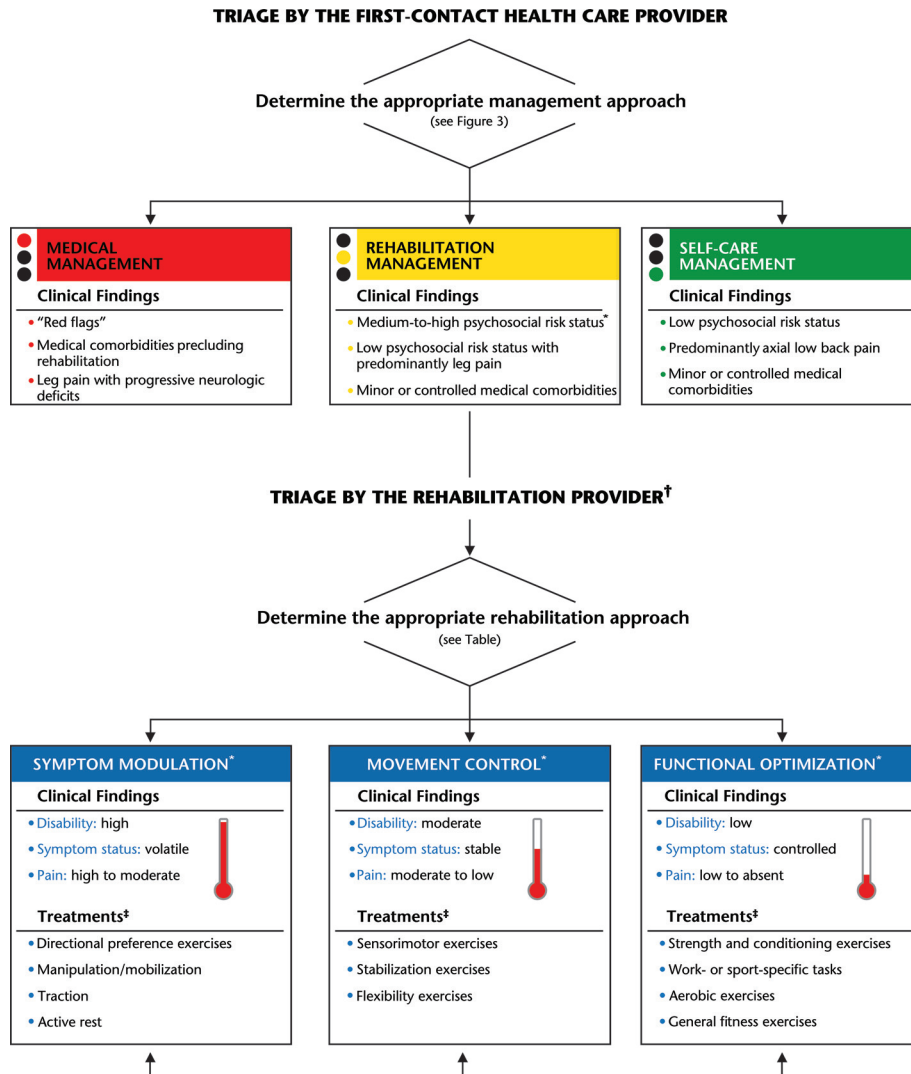
Figure 1.

Updated 2015 treatment-based classification system. * Regardless of approach, patients with a medium-to-high psychological risk profile require psychologically informed rehabilitation. † The rehabilitation provider also may function as the first-contact health care provider. ‡ Rehabilitation must be modified appropriately to account for a patient's comorbid status.

needed to return to higher levels of physical function; the goal of the treatment was to improve the patient's ability to perform higher levels of physical function without symptoms exacerbation.

Level 3 classified patients into syndromes embedded within each stage. Each syndrome was named after the intervention that the patient was going to receive (eg, mobilization syndrome, traction syndrome). To assign a patient to a particular intervention, a thorough physical examination was conducted to identify the treatment that would be best matched to the patient's clinical presentation.

Several strengths could be ascribed to the 1995 TBC system. At level 1, the TBC considered a process of patients triaging upon first contact to screen for "red flags" in direct access physical therapy clinics. Also, the 1995 TBC considered assessment of psychosocial factors using Waddell's signs and symptoms of "magnified illness behavior,"[14] which were the best available evidence to assess psychosocial factors at that time.

At level 2, the TBC described the staging process, which was the hallmark strength of the system because the TBC developers recognized that using number of days since onset was not useful in guiding treatment matching. Therefore, the TBC developers described the staging process to prescribe interventions according to the patient's pain intensity and disability status rather than relying on arbitrary definitions of acute, subacute, and chronic LBP based on time duration alone.

Table.
Triage Process and Matching Criteria for the Rehabilitation Provider

Rehabilitation Approach		Symptom Modulation	Movement Control	Functional Optimization
Classification Variables[a]	Pain rating	High to moderate	Moderate to low	Low to absent
	Disability rating[b]	High	Medium	Low
	Clinical status[c]	Volatile: symptoms predominate	Stable: movement impairments predominate	Well-controlled: performance deficits predominate
Treatment Modifying Variables	Psychosocial status[d]	+/−	+/−	+/−
	Comorbidities[e]	+/−	+/−	+/−

[a] When the classification variables do not agree, we recommend relying on disability rating to match the patient with the treatment approach. This judgment should be aided by the patient's clinical status.
[b] Disability can be assessed with any outcome measure of disability (eg, Modified Oswestry Disability Questionnaire, Roland-Morris Disability Questionnaire).
[c] "Volatile" means that the patient's clinical status can easily be aggravated, the patient is highly irritable (ie, minor lumbar spine movements easily provoke pain), and occasionally the patient's presentation does not permit physical examination. "Stable" means that the patient's clinical status can increase with certain movements, postures, or tests but return to baseline level relatively quickly. "Well-controlled" means that the patient's clinical status is asymptomatic most of the time but can be aggravated when performance demands are increased.
[d] Psychosocial status can be assessed using self-report measures (eg, Fear-Avoidance Behavior Questionnaire, STarT Back Tool). Plus sign (+) means the patient needs psychologically informed rehabilitation because of higher risk of developing poor treatment outcome. Minus sign (−) means the patient does not need psychologically informed rehabilitation because of no concern about developing poor treatment outcome.
[e] Comorbidities (eTab. 3) can be present, along with low back pain. Plus sign (+) means the patient needs to receive medical co-management for existing comorbidities besides rehabilitation care. Minus sign (−) means the patient does not need medical co-management.

Level 3 was the level at which the patient's signs and symptoms were matched to specific interventions. Interventions at this level targeted a wide array of patients with LBP along the spectrum of pain and disability status. The interventions were not confined to a specific concept; rather, they were open to other schools of thought.

Despite the strengths of the 1995 TBC, a number of limitations could be identified. At level 1, when psychosocial factors were identified, there was no specific suggestion of how to address these factors other than consultation with another health care provider.

At level 2, the TBC was somewhat ambiguous in describing the conceptual terms "levels," "stages," and "classification." This lack of clearly defined terms and decision-making variables confused some readers and led to misinterpretation of stage I, stage II, and stage III as acute, subacute, and chronic, respectively.

At level 3, one limitation was that the physical examination was largely based on findings related to the patient's static alignment or response to tissue loading tests, which could guide the treatment for patients in stage I, whose status required symptom modulation, but were not helpful in guiding the treatment for patients in stages II and III, whose status was related to the movement system impairments. As a result, the interventions in the 1995 TBC were exclusively designed to be matched with "syndromes" for stage I only and never fully developed for stage II or III.

Another limitation at level 3 was confusion over the "immobilization" syndrome. The immobilization syndrome was intended for patients with hyperacute LBP that was irritable (ie, pain can easily be provoked with minor lumbar spine movements) and still in the inflammatory phase. For such patients, immobilization meant limiting the patient's movements until the irritability and inflammation subsided. Unfortunately, "immobilization" was also the same term used to describe patients with signs and symptoms of "instability" that was aggravated with end-range movements. For patients with instability, immobilization meant limiting their end-range movements by the use of stabilization exercises. To resolve this confusion, the term "immobilization" for patients with instability was replaced with the term "stabilization." However, the term "stabilization" erroneously crept in as one of the primary interventions embedded in stage I, and many clinicians forgot about the concept of "rest from function" as a strategy for managing the hyperacute LBP.

The 1995 TBC was a classification framework based largely on clinical observations with minimal research to substantiate its theoretical basis. However, the 1995 TBC set the stage for a new era of research in the years following its publication.

TBC System—2007
A revision of the TBC was published in 2007 by Fritz et al[15] with the purpose of updating the 1995 TBC with the latest evidence that emerged between 1995 and 2007. This revision and update represented the second phase of development.

The major strength of the 2007 TBC was that it was much more evidence-based. The 2007 TBC incorporated evidence from clinical trials that showed that matching patients with treatment using the TBC principles resulted in improved clinical outcomes compared with alternative methods.[3,4] The 2007 TBC included evidence from a single randomized controlled trial that showed that the use of a clinical prediction rule for patients likely to respond to manipulation led to improved clinical outcomes.[6] Additionally, the 2007 TBC incorporated preliminary criteria for patients likely to

benefit from stabilization exercises[16] and updated the matching criteria for patients likely to improve with directional preference exercises.[15] Furthermore, the 2007 TBC replaced Waddell's signs and symptoms of magnified illness behavior with the use of Fear-Avoidance Beliefs Questionnaire.[14] This questionnaire was one of the criteria to consider in matching and predicting a patient's response to an intervention.[6,16]

However, a number of limitations could be noted regarding the 2007 TBC. First, the 2007 TBC did not contain any specific recommendations for how clinicians could manage patients with high psychosocial distress.

Second, the 2007 TBC removed the level 2 staging decision from the clinical decision-making process,[17] which shifted the focus away from the wide array of interventions listed in the 1995 TBC article for improvement in functional activities of daily living (stage II) and high physical performance (stage III). This removal resulted in a category broadly defined as "stabilization" exercises.

Third, the 2007 TBC criteria that were suggested to match a patient with a specific treatment did not always aid in matching.[18] When the criteria could not match the patient to manipulation, specific exercises, or traction, the patient was matched with stabilization exercises. As a result, the stabilization exercises subgroup became, in and of itself, a composite of heterogeneous patients with various signs and symptoms.

Fourth, the criteria did not consider deficits in muscle performance or motor control when matching patients to treatments. When patients with such deficits were assessed using the 2007 algorithm, they either were erroneously matched to stabilization exercises subgroup or remained unclassified.[19]

Finally, the 2007 TBC criteria did not ensure that patients are matched only to a single intervention, but rather 25% of the patients could satisfy the criteria for more than one subgroup.[18] This overlap pointed to the importance of creating a
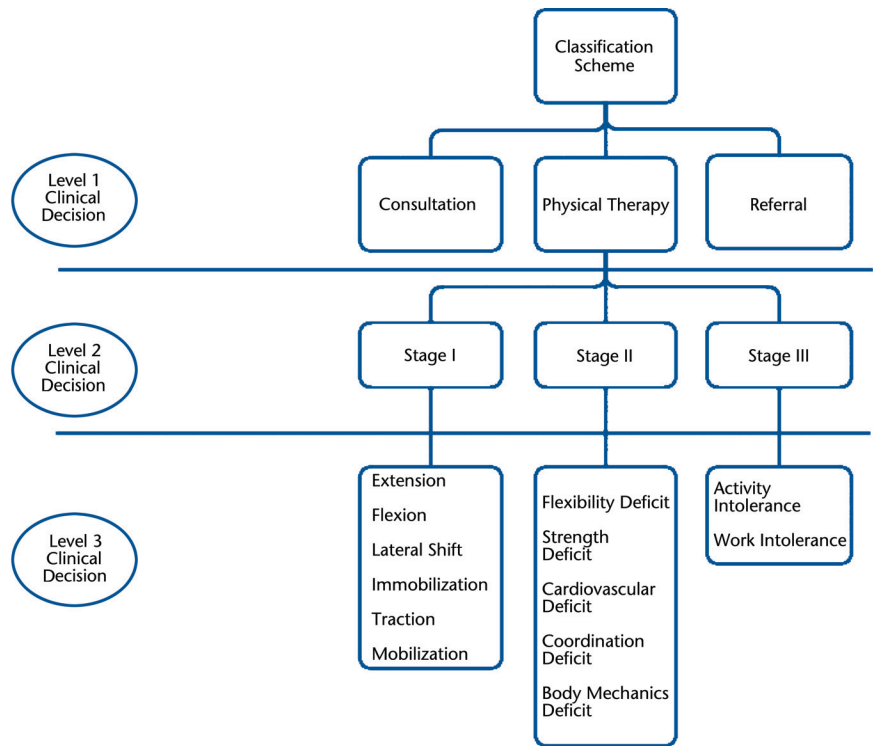

Figure 2.
The 1995 treatment-based classification system. Level 1 clinical decision classifies patients into 3 groups: (1) patients who cannot be managed by physical therapy and need to be referred for medical management because of great suspicion of serious pathology, (2) patients who may be managed by physical therapy but require consultation with another health care practitioner because of presence of chronic comorbidity or magnified illness behavior, and patients who can be managed independently by physical therapy. Level 2 is for patients who are determined appropriate for independent physical therapy. The level 2 clinical decision classifies such patients into 3 stages: (1) stage I is for patients with severe pain and disability status; the goal of the interventions is symptom modulation; (2) stage II is for patients whose pain is not too severe but interferes with their activities of daily living; the goal of the treatment is improving muscle impairments to perform activities of daily living; and (3) stage III is for patients who are relatively asymptomatic and can perform standard activities of daily living but need to return to higher levels of physical function; the goal of the treatment is to improve the patient's ability to perform higher levels of physical function without symptoms exacerbation. The level 3 clinical decision classifies patients into syndromes embedded within each stage.

hierarchical algorithm that prioritizes treatments based on clinical findings and allows for change within an episode of care.

The 2007 TBC produced an algorithm that was clinically applicable, but the developers were aware that the system had its limitations and foresaw that it was likely going to change. Fritz et al stated that "the process of developing a classification system is dynamic, and it is likely that future modification [to the TBC] will inevitably be made."[15(p299)] Therefore, the 2007 TBC algorithm should be

revised to incorporate the latest developments, optimize its comprehensiveness, refine current criteria, and explore additional treatments.[18]

TBC System—2015

This update of the 1995 TBC system represents the third phase of development, which we believe is timely because of many advances in the way care is delivered to patients with LBP. New research has improved our ability to predict the risk of patients with LBP developing poor treatment outcomes and subsequently prescribe interventions that bet-

ter match the identified risk level.[20] Also, psychosocial factors have been described in the literature, and the rehabilitation provider's competency in addressing them has been reported.[21] Additionally, various pain mechanisms that can underlie LBP have been highlighted.[22,23]

These advancements have been described in the APTA clinical practice guidelines for LBP.[12] These guidelines, in part, attempt to establish a common diagnostic language, as well as publish evidence-based principles for clinicians and researchers. However, the guidelines' recommendations have not been widely adopted by existing classification systems for LBP. Therefore, we are proposing a format that allows for the incorporation of the guidelines' recommendations into the 2015 TBC, which will provide a process by which the recommendations can be used efficiently in the clinical decision-making process for patients with LBP. We believe that linking these recommendations to the 2015 TBC also might guide researchers to new areas of investigation and direct clinicians to new patient management strategies (eTab. 1, available at ptjournal.apta.org).

The improvements on the TBC will be discussed in detail in a series of upcoming articles. In this article, we present an overview of the most recently updated TBC algorithm.

Overview of the Updated TBC Algorithm—2015

The 2015 TBC algorithm proposes 2 levels of triage: one at the level of the first-contact health care provider and another at the level of the rehabilitation provider (Fig. 1). At the level of the first-contact health care provider, the triage can be assumed by any practitioner competent in LBP care, regardless of his or her professional background (ie, primary care physician, nurse practitioner, physical therapist, chiropractor). This individual's responsibility is to determine the appropriate approach of management. At the level of the rehabilitation provider, the purpose of the triage is to determine which rehabilitation approach is appro-

priate for the patient and what factors may affect the treatment.

Triage at the Level of the First-Contact Health Care Provider

Upon initial contact, patients with LBP should be triaged using 1 of 3 approaches: medical management, rehabilitation management, or self-care management. Patients requiring medical management are those with red flags of serious pathology (eg, fracture, cancer) or serious comorbidities that do not respond to standard rehabilitation management (eg, rheumatoid arthritis, central sensitization). Serious pathologies can mimic nonspecific mechanical LBP and should be ruled out upon initial assessment.[24] Red flags are best investigated in clusters of signs and symptoms,[25] with each cluster denoting the presence of a particular pathology (eTab. 2, available at ptjournal.apta.org).

Central sensitization is a condition that will require careful attention (eTab. 2). Central sensitization has been defined as an altered mechanism of pain processing within the central nervous system (ie, enhanced synaptic excitability, lower threshold of activation, and expansion of the receptive fields of nociceptive input).[26] In this condition, the pain initially may have been caused by a peripheral pain generator, but now the pain has lasted beyond the normal healing time (ie, chronic pain).[23] The pain distribution is widespread and does not follow an anatomical pattern. The pain also can easily be provoked with low-intensity stimuli that would not normally generate pain (eg, light touch). A key feature of this pain is the disproportionate mechanical provocation patterns in response to clinical examination.[27]

Central sensitization has a strong association with psychological factors such as negative beliefs, pathological anxiety or depression, and poor coping strategies. When such factors are present with the aforementioned features of central sensitization, the patient is unlikely to benefit from standard rehabilitation including the principles of the TBC. These patients require a multidisciplinary approach to pain management, including pharmaco-

logical intervention, psychotherapy, and specialized rehabilitation.

Comorbidities can be present along with mechanical LBP[28] and should be investigated upon initial assessment as well (eTab. 3, available at ptjournal.apta.org).[24] Comorbidities have been linked to increased health care utilization, higher costs, and poor treatment outcome.[28-30] Comorbidities, physical or psychological, can be identified using a medical screening questionnaire plus patient report. When comorbidities are found in association with mechanical LBP, medical co-management (eg, pharmacotherapy) may become necessary in order to achieve optimal rehabilitation outcomes.

Patients who do not have serious pathologies are appropriate for either rehabilitation or self-care management. Patients amenable to self-care management are those who are unlikely to develop disabling LBP during the course of the current episode. Such patients can be identified using risk profiling instruments such as the STarT Back Tool,[31] Örebro Musculoskeletal Pain Questionnaire,[32] or similar self-report questionnaires. These patients have low levels of psychosocial distress, no or controlled comorbidities, and normal neurological status. They may be treated with patient education that consists of reassurance about the generally favorable prognosis for acute LBP and advice about medication, work, and activity.[20]

Patients who are appropriate for rehabilitation management are the remaining majority, as serious pathology is very rare among patients with LBP,[33] and patients amenable to self-care management represent a small portion of patients with LBP seen in primary care clinics.[20] We believe the majority of patients should be referred quickly to a well-trained rehabilitation provider. This triaging process of the first-contact health care provider is recapitulated in Figure 3.

Triage at the Level of Rehabilitation Provider

In some situations, the rehabilitation provider could be the first-contact health care provider. In that case, the rehabili-
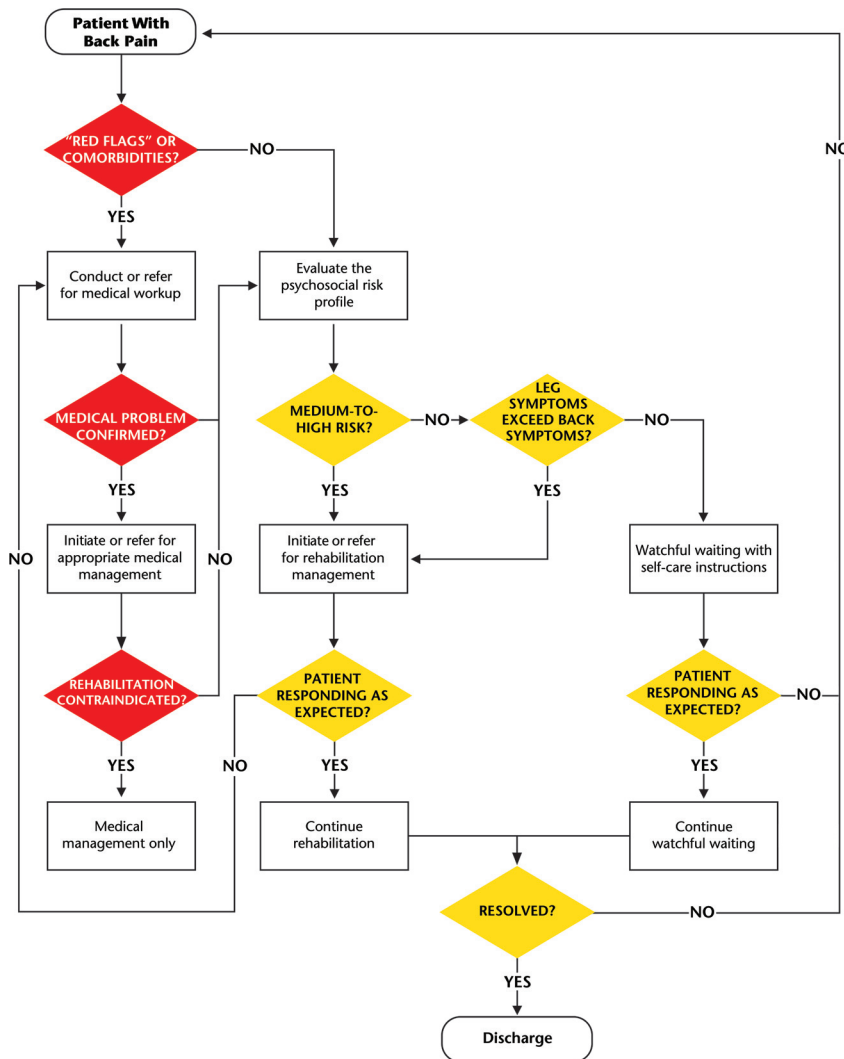
Figure 3.
Low back pain triage process for the first-contact health care provider. Central sensitization is one of the comorbidities associated with widespread pain that is disproportionate to provocative mechanical testing (eTab. 2). This condition is strongly associated with elevated psychological distress. Patients with central sensitization should receive medical management that includes pharmacotherapy and psychotherapy, as well as specialized rehabilitation. Patients at high psychological risk (eg, pain catastrophizing, fear of movement, anxiety, and depression) should receive psychologically informed rehabilitation.

The next step in the triage process of the rehabilitation provider is matching the patient's clinical status to 1 of 3 rehabilitation approaches: symptom modulation, movement control, or functional optimization (Fig. 1). Matching the patient to each approach relies on the assessment of pain intensity, disability status, and perception of clinical status. Also, the matching must consider findings related to the patient's comorbid and psychosocial status (Table). This approach is supported by the APTA clinical practice guidelines for LBP,[12] and consistent with the research standards of the National Institutes of Health task force for LBP.[34]

Depending on the approach to which the patient is matched, the rehabilitation provider should plan the appropriate physical examination. Patients matched to the symptom modulation approach should be assessed using a physical examination that elicits symptom modulation behavior (eg, centralization, peripheralization). Patients matched to the movement control approach should be assessed using a physical examination that identifies impairments in movement patterns. Patients matched to the functional optimization approach should be assessed using a physical examination that accounts for the unique functional demands of a specific job or sport.

Symptoms modulation approach. A symptom modulation approach is matched to patients with recent—new or recurrent—LBP episode that is currently causing significant symptomatic features (Table). Because their clinical status is volatile, these patients tend to avoid certain postures; active range of motion is limited and painful. The neurological examination can reveal increased sensitivity. These patients need interventions that modulate their symptoms. In this group, patients are treated mainly with manual therapy, directional preference exercises, traction, or immobilization.

Movement control approach. A movement control approach is matched to patients who have low-to-moderate levels of pain and disability that interfere with their activities of daily living
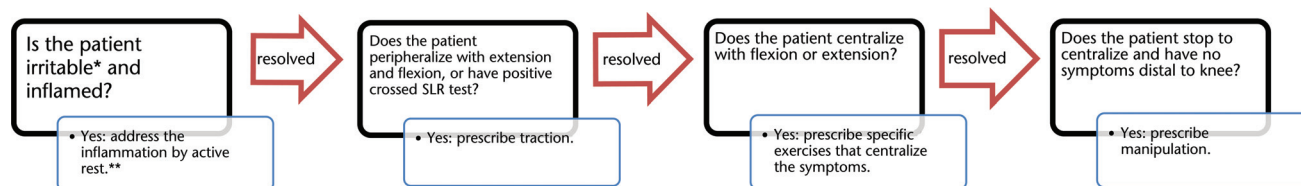
tation provider would initially triage the patient in the same way outlined above. When the triage determines that the patient is appropriate for rehabilitation management, the rehabilitation provider should continue to match the patient with 1 of the 3 rehabilitation approaches shown in Figure 1 and described below.

In other situations, the rehabilitation provider may receive patients with LBP via a referral from another health care provider. In that case, we recommend that

rehabilitation providers be watchful for red flags that might have been overlooked by the referring health care provider. Also, the rehabilitation provider should attempt to determine whether the patient has any physical or psychological comorbidities that might necessitate medical co-management. Also, the rehabilitation provider should evaluate the psychosocial status of the patient to determine whether a psychologically informed rehabilitation is necessary.

Figure 4.
Example of hierarchical exercise progression for patients matched to symptom modulation approach. Patients who need the symptom modulation approach can satisfy the criteria for more than one treatment subgroup. We suggest that the treatment should take the progression shown in the Figure. For example, if a patient's status centralizes with extension, the rehabilitation specialist should emphasize extension exercises until the patient's status plateaus. At that time, manipulation can ensue. * Irritable means that minor movements of the lumbar spine can easily provoke the symptoms. ** Active rest means limiting the patient's movement until the inflammation subsides. Such patients are usually seen within the first 24 hours of injury. SLR=straight leg raising.

(Table). The patient's status tends to be stable; that is, the patient describes a low baseline level of pain that increases by doing certain daily activities; however, the pain returns to its low-level baseline as soon as the patient ceases the activity. Other patients may describe recurrent attacks of LBP that are aggravated with sudden or unexpected movement, but currently they are asymptomatic or in remission. The patient's active spinal movements are typically full but may be accompanied by aberrant movements. The physical examination can reveal findings of impaired flexibility, muscle activation, and motor control. These patients need interventions to improve the quality of their movement system. For this group, the treatment in the 2007 TBC system mainly relied on stabilization exercises.[16,35] In this updated 2015 TBC, however, we believe that stabilization exercises must be better defined, and other treatments need to be explored.

Functional optimization approach.
A functional optimization intervention is for patients who are relatively asymptomatic; they can perform activities of daily living but need to return to higher levels of physical activities (eg, sport, job). The patient's status is well controlled (Table); that is, the pain is aggravated only by movement system fatigue. These patients may not have flexibility or control deficits, but they have impairments in movement system endurance, strength, and power that do not meet their physical demands.[36] These patients need interventions that maximize their physical performance for higher levels of physical activities. For this group, the treatment should optimize the patient's

performance within the context of a job or sport.

Considerations Related to the Rehabilitation Approaches

The 3 rehabilitation approaches are mutually exclusive; however, patients can always be reclassified to receive a different rehabilitation approach as their clinical status changes (Fig. 1). For example, a patient who initially receives a movement control approach due to moderate levels of pain and disability can be reclassified to receive a functional optimization approach if his or her status improves to low pain and disability status, or the patient can be reclassified to receive a symptoms modulation approach if his or her status suddenly worsens. Alternatively, a patient can be discharged at any point when rehabilitation goals are attained.

It should be noted that, within each of the 3 rehabilitation approaches, a patient might fit the criteria of 2 or more treatment options, which requires prioritization of treatment. For example, in the symptom modulation approach, a patient may satisfy the criteria for manipulation and extension exercises as shown by Stanton et al.[18] In that case, extension exercises take priority over manipulation. Extension exercises should be the treatment of choice until the patient's status plateaus. At that moment, manipulation may ensue (Fig. 4). Similarly, in the movement control approach, a patient may have motor control impairment and reduced muscle performance. In that case, motor control deficit takes priority over the muscle

reduced performance. When the control deficit is corrected, muscle performance training can ensue (Fig. 5). This method of prioritization process is largely based on common clinical sense, warrants further research, and will be described in future articles.

To achieve optimal treatment outcomes, it is not enough to only match patients based on the above 3 rehabilitation approaches, but matching also should consider the patient's psychosocial status and concurrent comorbidities because they can weaken the treatment effect (Table). When psychosocial factors are high, the rehabilitation provider should educate the patient about pain theory, muscle relaxation techniques, sleep hygiene, and coping skills and address catastrophizing about pain and diagnostic findings. When medical comorbidities are identified, medical co-management is necessary.

Conclusion and Future Directions

We reviewed the phases of development of the original 1995 TBC and the subsequent revisions that were published in 2007. We have presented an updated version of the TBC, maintaining its previously developed strengths and improving upon its limitations. In this updated TBC, we recommend a 2-level triage process: (1) initial triage by a first-contact health care provider (regardless of profession) to determine which patients are amenable to rehabilitation and (2) secondary triage by a rehabilitation provider to determine the most appropriate rehabilitation approach. The initial triage process now recognizes 2 types of patients
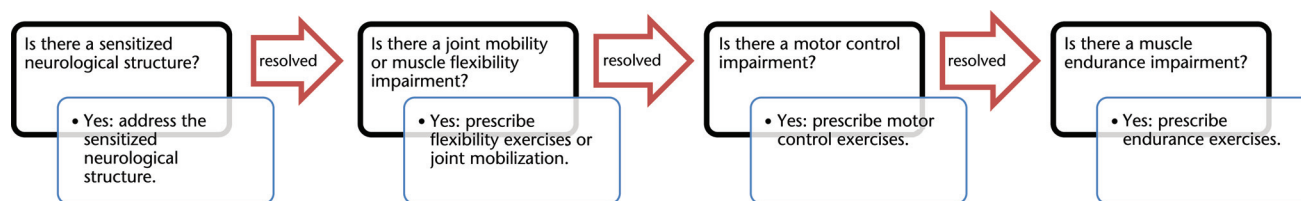
Figure 5.
Example of hierarchical exercise progression for patients matched to movement control approach. These impairments can be present in a patient all at once or any combination of them. To address these impairments, we suggest that the treatment should take the progression shown in the Figure. The treatment of a particular impairment does not mean ignoring other impairments; that is, if a patient has flexibility and motor control impairments, the rehabilitation specialist should emphasize flexibility exercises in the earlier sessions of treatment, with the possibility of addressing some aspects of the motor impairments. As the flexibility impairment improves, the rehabilitation specialist should emphasize motor control exercises in the later sessions.

who are not candidates for rehabilitation management: those with red flags of potentially serious medical disease or central sensitization syndromes and those who are likely to do well with a self-care management approach.

Additionally, this updated TBC embraces the biopsychosocial model of back pain management, including the importance for risk assessment and the need to address psychological factors, regardless of the rehabilitation approach. The rehabilitation-level triage establishes decision-making criteria that can be used by any rehabilitation provider to determine the most appropriate rehabilitation approach for the patient with LBP, using pain and disability status (Table). We also HAVE linked the recommended treatment approaches in this TBC to APTA's clinical practice guidelines for LBP.

This article has provided a general overview of the major updates and revisions to the TBC, with more detailed information to be presented in a series of upcoming articles. One article will be devoted to the first-contact provider triage process, with discussions about assessment of red flags, medical and psychosocial comorbidities, and the need for a psychologically informed rehabilitation approach for patients at high risk of developing chronic LBP. Another article will include more detailed descriptions of the rehabilitation provider triage process that sorts patients into the most appropriate rehabilitation approach. Each of the 3 rehabilitation approaches will be the focus of an individual article that discusses the physical examination procedures for that specific approach, suggesting subgroup-matched interventions. We hope that the information provided in these future articles will stimulate thoughts and future research related to the concept of matching interventions to appropriate subgroups of patients with back pain.

References

1 Hayden JA, van Tulder MW, Malmivaara AV, Koes BW. Meta-analysis: exercise therapy for nonspecific low back pain. *Ann Intern Med.* 2005;142:765–775.

2 Hayden JA, van Tulder MW, Tomlinson G. Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. *Ann Intern Med.* 2005;142:776–785.

3 Fritz JM, Delitto A, Erhard RE. Comparison of classification-based physical therapy with therapy based on clinical practice guidelines for patients with acute low back pain: a randomized clinical trial. *Spine (Phila Pa 1976).* 2003;28:1363–1371; discussion 1372.

4 Brennan GP, Fritz JM, Hunter SJ, et al. Identifying subgroups of patients with acute/subacute "nonspecific" low back pain: results of a randomized clinical trial. *Spine (Phila Pa 1976).* 2006;31:623–631.

5 Vibe Fersum K, O'Sullivan P, Skouen JS, et al. Efficacy of classification-based cognitive functional therapy in patients with non-specific chronic low back pain: a randomized controlled trial. *Eur J Pain.* 2013;17:916–928.

6 Childs JD, Fritz JM, Flynn TW, et al. A clinical prediction rule to identify patients with low back pain most likely to benefit from spinal manipulation: a validation study. *Ann Intern Med.* 2004;141:920–928.

7 Henschke N, Maher CG, Refshauge KM, et al. Low back pain research priorities: a survey of primary care practitioners. *BMC Fam Pract.* 2007;8:40.

8 Hefford C. McKenzie classification of mechanical spinal pain: profile of syndromes and directions of preference. *Man Ther.* 2008;13:75–81.

9 Sahrmann SA. *Diagnosis and Treatment of Movement Impairment Syndromes.* St Louis, MO: Mosby Inc; 2002.

10 O'Sullivan P. Diagnosis and classification of chronic low back pain disorders: maladaptive movement and motor control impairments as underlying mechanism. *Man Ther.* 2005;10:242–255.

11 Delitto A, Erhard RE, Bowling RW. A treatment-based classification approach to low back syndrome: identifying and staging patients for conservative treatment. *Phys Ther.* 1995;75:470–485; discussion 485–479.

12 Delitto A, George SZ, Van Dillen LR, et al; Orthopaedic Section of the American Physical Therapy Association. Low back pain. *J Orthop Sports Phys Ther.* 2012;42:A1–A57.

13 Karayannis NV, Jull GA, Hodges PW. Physiotherapy movement based classification approaches to low back pain: comparison of subgroups through review and developer/expert survey. *BMC Musculoskelet Disord.* 2012;13:24.

14 Waddell G, Newton M, Henderson I, et al. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain.* 1993;52:157–168.

15 Fritz JM, Cleland JA, Childs JD. Subgrouping patients with low back pain: evolution of a classification approach to physical therapy. *J Orthop Sports Phys Ther.* 2007;37:290–302.

16 Hicks GE, Fritz JM, Delitto A, McGill SM. Preliminary development of a clinical prediction rule for determining which patients with low back pain will respond to a stabilization exercise program. *Arch Phys Med Rehabil.* 2005;86:1753–1762.

17 Fritz JM, Brennan GP, Clifford SN, et al. An examination of the reliability of a classification algorithm for subgrouping patients with low back pain. *Spine (Phula Pa 1976).* 2006;31:77–82.

18 Stanton TR, Fritz JM, Hancock MJ, et al. Evaluation of a treatment-based classification algorithm for low back pain: a cross-sectional study. *Phys Ther.* 2011;91:496–509.

19 Stanton TR, Hancock MJ, Apeldoorn AT, et al. What characterizes people who have an unclear classification using a treatment-based classification algorithm for low back pain? A cross-sectional study. *Phys Ther.* 2013;93:345–355.

20 Hill JC, Whitehurst DG, Lewis M, et al. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. *Lancet.* 2011; 378:1560–1571.

21 Bryant C, Lewis P, Bennell KL, et al. Can physical therapists deliver a pain coping skills program? An examination of training processes and outcomes. *Phys Ther.* 2014; 94:1443–1454.

22 Smart KM, Blake C, Staines A, Doody C. The discriminative validity of "nociceptive," "peripheral neuropathic," and "central sensitization" as mechanisms-based classifications of musculoskeletal pain. *Clin K Pain.* 2011;27:655–663.

23 Woolf CJ. Central sensitization: implications for the diagnosis and treatment of pain. *Pain.* 2011;152(3 suppl):S2–S15.

24 Dagenais S, Tricco AC, Haldeman S. Synthesis of recommendations for the assessment and management of low back pain from recent clinical practice guidelines. *Spine J.* 2010;10:514–529.

25 Henschke N, Maher CG, Refshauge KM, et al. Prevalence of and screening for serious spinal pathology in patients presenting to primary care settings with acute low back pain. *Arthritis Rheum.* 2009;60: 3072–3080.

26 Latremoliere A, Woolf CJ. Central sensitization: a generator of pain hypersensitivity by central neural plasticity. *J Pain.* 2009; 10:895–926.

27 Smart KM, Blake C, Staines A, et al. Mechanisms-based classifications of musculoskeletal pain: part 1 of 3: symptoms and signs of central sensitisation in patients with low back (+/− leg) pain. *Man Ther.* 2012;17:336–344.

28 Gore M, Sadosky A, Stacey BR, et al. The burden of chronic low back pain: clinical comorbidities, treatment patterns, and health care costs in usual care settings. *Spine (Phila Pa 1976).* 2012;37:E668–E677.

29 Ritzwoller DP, Crounse L, Shetterly S, Rublee D. The association of comorbidities, utilization and costs for patients identified with low back pain. *BMC Musculoskelet Disord.* 2006;7:72.

30 Goode A, Cook C, Brown C, et al. Differences in comorbidities on low back pain and low back related leg pain. *Pain Pract.* 2011;11:42–47.

31 Hill JC, Dunn KM, Lewis M, et al. A primary care back pain screening tool: identifying patient subgroups for initial treatment. *Arthritis Rheum.* 2008;59:632–641.

32 Linton SJ, Boersma K. Early identification of patients at risk of developing a persistent back problem: the predictive validity of the Örebro Musculoskeletal Pain Questionnaire. *Clin J Pain.* 2003;19:80–86.

33 Henschke N, Maher CG, Ostelo RW, et al. Red flags to screen for malignancy in patients with low-back pain. *Cochrane Database Syst Rev.* 2013;2:CD008686.

34 Deyo RA, Dworkin SF, Amtmann D, et al. Report of the NIH task force on research standards for chronic low back pain. *Spine (Phila Pa 1976).* 2014;39:1128–1143.

35 Rabin A, Shashua A, Pizem K, et al. A clinical prediction rule to identify patients with low back pain who are likely to experience short-term success following lumbar stabilization exercises: a randomized controlled validation study. *J Orthop Sports Phys Ther.* 2014;44:6-B13.

36 McGill S. *Low Back Disorders: Evidence-Based Prevention and Rehabilitation.* 2nd ed. Champaign, IL: Human Kinetics; 2007.