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Perspective

Staged Approach for Rehabilitation Classification: Shoulder Disorders (STAR–Shoulder)

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Abstract

Shoulder disorders are a common musculoskeletal problem causing pain and functional loss. Traditionally, diagnostic categories are based on a pathoanatomic medical model aimed at identifying the pathologic tissue(s). However, the pathoanatomic model may not provide diagnostic categories that effectively guide treatment decision-making in rehabilitation. We propose an expanded classification system that includes the pathoanatomic diagnosis but also includes a rehabilitation classification based on tissue irritability and identified impairments. For the rehabilitation classification, three levels of irritability are proposed and defined with corresponding strategies guiding intensity of treatment based on the physical stress theory. Common impairments are identified and are used to guide specific intervention tactics with varying levels of intensity. The proposed system is conceptual and needs to be tested for reliability and validity. This classification system may be useful clinically for guiding rehabilitation intervention and provides a potential method of identifying relevant subgroups in future research studies. While the system was developed and applied to shoulder disorders, it may be applicable to classification and rehabilitation of musculoskeletal disorders in other body regions.

Introduction

Shoulder disorders are a common musculoskeletal problem[1] causing pain and functional loss.. Traditionally, diagnostic categories are based on a pathoanatomic medical model aimed at identifying the pathologic tissue(s). Much work has been published regarding diagnostic accuracy of the history and physical examination tests[2] used to diagnose patients with shoulder disorders. However, the pathoanatomic model may not provide diagnostic categories that effectively guide treatment decision-making in rehabilitation.[3,4] In fact, recent evidence suggests a poor relationship between diagnostic label and chosen rehabilitation interventions among orthopedic physical therapists.[5] We believe an alternative classification could be more relevant and useful for specifically guiding rehabilitation. The purpose of this paper is to propose a new classification system that expands upon the traditional pathoanatomic diagnostic classification, to guide rehabilitation. This expanded classification is designed to match rehabilitation interventions to patient subgroups and stages, to facilitate more effective care.

In the traditional medical model, musculoskeletal shoulder disorders are classified based on a pathoanatomic diagnosis to guide decisions for treatment and prognosis. Examples of these diagnoses would be rotator cuff tear or tendinopathy, adhesive capsulitis, glenohumeral anterior instability and superior labral anterior-posterior (SLAP) lesions. The pathoanatomic diagnosis infers that patients with the same tissue pathology form a homogenous group. Also implicit in this model is that patients with the same pathology should be managed in the same way, have similar prognoses, and that the diagnosis remains static over an episode of care. However, clinicians guiding patients through rehabilitation are well aware that signs and symptoms often change across an episode of care which requires modification of the intervention, and may change prognosis. The pathoanatomic model also implies that the pathology explains patient

symptoms and disability (activity limitations and participation restrictions), and that correcting the pathology will improve the symptoms and disability. While the pathoanatomic system of diagnosis may be very appropriate for surgical decision making, it may be inadequate for guiding rehabilitation.[3] Pathoanatomic diagnostic categories may encompass patients with similar tissue pathology, but within each pathoanatomic category there likely exists a heterogeneous group of patients that have different or varying degrees of impairment (loss of body structure and function) and pain that warrant different rehabilitation strategies.

To illustrate, consider two patients accurately pathoanatomically diagnosed with "rotator cuff tendinopathy" based on impingement tests, a painful arc and pain with isometric resistive testing, but who present with very different pain and impairments. Patient A presenting with high levels of acute pain following a recent period of overuse would likely be managed with activity modification, ice, anti-inflammatory medication and pain-free range of motion (ROM) exercise with consideration for a subacromial injection. Patient B presenting with chronic low level pain brought on mainly by prolonged or strenuous overhead activity, shows primary impairments of posterior shoulder tightness and scapular muscle weakness. This patient would likely be managed very differently with an emphasis on frequent and prolonged posterior shoulder stretching and scapular muscle strengthening with resistance to fatigue. Additionally, patient A may likely change over an episode of rehabilitation look more like patient B with specific impairments to be accurately identified and treated. In both cases, the pathoanatomic diagnosis of "rotator cuff tendinopathy" could be supported and remain accurate over the episode of care, while specific pain, symptoms, and impairments dictate very different rehabilitation strategies and interventions.

Pathoanatomic classification may partially enable rehabilitation decision-making through the application of tissue-healing principles that guide treatment decisions and prognosis for shoulder disorders. For example, the pathoanatomic diagnosis of adhesive capsulitis indicates treatment to restore shoulder ROM and that recovery is typically protracted over months.[6] However, it does not indicate which shoulder motions are impaired, nor does it indicate the appropriate intensity of treatment. Likewise, knowing a patient has sustained a Bankart lesion of the anterior labrum would suggest an initial period of limiting external rotation ROM, but would not fully inform rehabilitation interventions directed toward potential concomitant impairments such as weakness or poor scapular control. Inconsistent relationships between tissue pathology and impairments[3,7-10] limit the sole use of pathology for clinical decision-making in rehabilitation. The pathoanatomic diagnosis alone cannot fully direct the intensity and specific intervention tactics used in the rehabilitation management of patients with musculoskeletal shoulder disorders.[3,4,11] We propose a classification system that includes the pathoanatomic diagnosis, but is also expanded to consider tissue irritability and individual impairments. We believe the concepts of tissue irritability and the identification of specific impairments, integrated with available knowledge of the patient's pathoanatomy can be used to more effectively guide rehabilitation. Moreover, this could facilitate improved outcomes, and reduce overall healthcare costs.

Classification systems primarily aim to guide treatment decision-making as well as inform prognosis. Additionally, diagnostic categories are important for communication between payers, healthcare providers, researchers, and those utilizing research findings. In order to accomplish these various goals, a classification system should have mutually exclusive categories that identify subgroups within a patient population that require a unique treatment

approach. There are multiple classification systems for the shoulder, but they lack relevant

categories to guide rehabilitation, the categories are not mutually exclusive, and they are largely

based on pathology.[5,12] Specific rehabilitation treatment-based classification systems that go

beyond a pathoanatomic diagnosis have been developed for neck and low back pain;[13,14] with

patients subgrouped based on the history, impairments, and specific symptomatic responses to

mechanical stress. Evidence indicates improved patient-rated outcomes when patients received

the treatment matched to their category of classification as compared to those patients who did

not receive the matched treatment for neck and low back pain.[15,16] Furthermore, cost of care for

rehabilitation was lower in those receiving matched treatment.[17] Rehabilitation guided by

classification systems, or stratified care,[18,19] can improve patient-rated outcomes and reduce

immediate and downstream healthcare costs of care. [20-23]The purpose of this clinical commentary

is to propose a Staged Approach for Rehabilitation (STAR) classification system for shoulder

pain (STAR–Shoulder). We propose a staged approach to classification that includes: 1)

screening, 2) pathoanatomic diagnosis, and 3) a rehabilitation classification based on irritability

rating and primary impairments. (see Figure 1) We also propose a system that matches

intervention strategies and tactics with the categories of classification. The rehabilitation

classification of patients based on tissue irritability and impairments enables the development of

a directed rehabilitation treatment program.

Staged Approach to Classification

      Overview

        After appropriate screening, the pathoanatomic diagnosis is used to classify

patients in the staged classification system. This is derived from a combination of history,

specific special tests and results of imaging if available. Evidence from systematic reviews and

practice guidelines [20-23] indicate that recommended interventions are often similar for some pathoanatomic diagnoses of the shoulder. The rehabilitation classification is used to guide the intensity and specific focus of rehabilitation. The intensity of the rehabilitation program is based on the level of tissue irritability and specific interventions are selected based on observed key impairments, those hypothesized to relate to the patient activity limitations and participation restrictions. For clarity, pathoanatomic diagnosis and rehabilitation classification are depicted sequentially (Figure 1). However, they both are derived primarily from the history and physical examination and, in practice, are likely derived in parallel rather than sequentially.

Level 1 – Screening

Screening includes taking a history and performing a basic physical examination to gain a general impression of the problem and identify potential "red flags" and "yellow flags". For red flags, the history and physical examination findings are used to determine if there are signs and symptoms consistent with a musculoskeletal problem amenable to rehabilitation, rather than a more serious disorder requiring further assessment and medical care. [24-26] Critical to the screening is the identification of red flags that may indicate a serious pathology such as a tumor or infection that requires referral to an appropriate healthcare professional. While a full discussion of red flag screening is beyond the scope of this paper, Mitchell[25] has suggested a basic list of elements that include tumor, infection, acute trauma suggesting fracture or dislocation, and unexplained neurologic symptoms (see Table 1). We have added pain of visceral origin to this list proposed by Mitchell. Examples of shoulder pain from visceral origin could include gall bladder and cardiac pathology. Goodman [26] described a more extensive

screening approach and emphasized the possibility of referred pain from cardiopulmonary structures and the thoracic viscera.

Screening for yellow flags is performed to determine psychosocial issues such as passive coping style, pain catastrophizing, fear of movement, and general psychological distress that can impact rehabilitation. Specifically, these factors may affect outcome of care, how treatment interventions are delivered, and direct specific patient education strategies. Patients with these factors may also be indicated for a direct referral for treatment by other healthcare providers. Elevated scores on the Tampa Kinesiophobia Scale or Fear Avoidance Beliefs Questionnaire have demonstrated a relationship to a longer recovery, chronic symptoms and work loss in patients with shoulder pain. [27-29] History and physical examination findings obtained during screening are also used to aid subsequent classification in Level 2 (Pathoanatomic Diagnosis) and Level 3 (Rehabilitation Classification).

Level 2 – Pathoanatomic Diagnosis

The pathoanatomic diagnosis is made based on identifying the presumed tissue pathology generating the symptoms. The history and physical examination findings from Level 1 are used along with the results of tissue-based, special tests as well as any imaging procedures to make a pathoanatomic diagnosis. The first step is to verify that the symptoms are attributable to shoulder pathology rather than referred pain from a more proximal source such as the cervical spine or thoracic outlet.[30] Distribution of symptoms, cervical spine rotation range of motion, Spurling's test, and neural tension tests are the most helpful examination findings for distinguishing cervical spine pain.[31,32] While these more proximal problems may still be amenable to rehabilitation, they are beyond the scope of the STAR–shoulder.

The findings from the basic physical examination performed during the screening are used along with a vast array of available special tests to attempt to identify the specific tissue(s) responsible for shoulder symptoms. As examples, the key positive and negative findings associated with the most common shoulder pathologies are shown in Table 2. While many diagnostic accuracy studies have been performed for various special tests and pathologies, there is considerable variation in findings among studies.[2] We selected tests to define each category based on current evidence.[2] It is important to note that most of the diagnostic accuracy studies performed on special tests of the shoulder use either imaging or direct visualization at surgery as a gold-standard in determining accuracy. Therefore, the gold standard is based on identified tissue pathology rather than direct evidence that the pathologic tissue is actually producing the symptoms. Imaging procedures such as radiographs, ultrasound and magnetic resonance imaging (MRI) would also fit with this level of diagnosis as they help to directly identify tissue pathology.

One of the primary intervention decisions made at this level is surgery versus non-surgery which may include medication, corticosteroid injection, rest and rehabilitation. This is an appropriate decision point, since surgical intervention is designed to address specific anatomic pathologies. While specific indications for a surgical rather than a non-surgical approach are often unclear and the subject of considerable debate, [23] this level is where that decision occurs. Entities such as acute or traumatic full thickness rotator cuff tears, recurrent glenohumeral dislocations in younger active patients, or severe glenohumeral arthritis can often be managed successfully with surgery. [33-37] However, some patients with clearly proven tissue deficits such as partial or full thickness rotator cuff tears may also respond well without surgical intervention.

[38] Future research identifying specific characteristics predicting success with surgical or non-surgical intervention will be important to improving classification.

The tissue-based, pathoanatomic medical diagnosis classification of musculoskeletal shoulder pain has a large number of categories consisting of a single diagnosis or a combination of diagnoses.[11] We have chosen to illustrate only a few of the most common entities seen by physical therapists as examples. The category of 'subacromial pain syndrome' is particularly challenging [3] and would include common pathoanatomic labels such as subacromial impingement, bicipital tendinopathy, rotator cuff tendinopathy and tears, subacromial bursitis, secondary instability, and superior labral anterior-to-posterior (SLAP) lesions. The current use of such a large number of pathoanatomic diagnostic categories that are not easily differentiated by a physical examination is impractical, and also likely does not facilitate treatment decision-making for rehabilitation.

Level 3 - Rehabilitation Classification –Tissue irritability and Impairments.

The rehabilitation categories are based on the stage of tissue irritability to guide the intensity of treatment, and impairments are used to guide the selection of specific rehabilitation techniques. The concept of tissue "irritability" is meant to reflect the tissue's ability to handle physical stress and theoretically relates to its physical status and the degree of inflammatory activity present. Three phases of irritability, developed by consensus,[6] are operationally defined in Table 3 using pain levels, the relationship between pain and motion, and self-report of disability. These irritability stages are meant to be mutually exclusive and therefore are the primary means of classifying at this level. The physical intensity of intervention can then be directly matched to the stage of irritability. We intentionally did not include specific thresholds

for each disability criteria for tissue irritability using patient-rated outcome instruments as there is no single standard accepted patient-rated outcome instrument, and no current basis for specific thresholds. We hope to encourage identification of thresholds through appropriate future research. Tissue irritability staging is useful in guiding rehabilitation that aims to place the appropriate physical stress on the tissue at each stage. Patients with high irritability are not ready for significant physical stress to the affected tissues and therefore the treatment would emphasize activity modification and appropriate modalities, medication and manual therapy to relieve pain and inflammation, with only low levels of physical stress via exercise. Patient education during this stage would typically emphasize how to avoid harmful stress to the affected tissue(s) while maintaining appropriate stress to uninvolved tissues. The treatment strategy for patients with moderate irritability is controlled physical stress in the form of progressive manual therapy, mild stretching and motor control exercises and basic functional activity. The low irritability category describes those patients that have little pain and whose tissues are ready for progressive physical stress in the form of stretching, manual therapy, resistive exercise and higher demand physical activity. Categorizing the stage of tissue irritability enables the selection of a matched intervention intensity.

Further specific guidance in rehabilitation is based on identified impairments that are deemed relevant because they are believed to either perpetuate the pathology or cause functional loss and disability. Table 4 describes common shoulder impairments, and the associated matched treatment strategies. Impairment categories are not mutually exclusive and a specific patient may have multiple impairments present, therefore impairments should be considered only as a secondary means of classification. A full explanation of how to best identify each of these impairments in an examination is beyond the scope of this paper. However we think the list

given in table 4 captures the common impairments related to shoulder dysfunction that are used to select appropriate rehabilitation interventions.   Identifying impairments is an essential part of the examination because patients with the same pathoanatomic diagnosis and level of irritability may have differing impairments and therefore require different intervention strategies. For example, one patient may have a "subacromial pain syndrome" associated with glenohumeral laxity while another patient may have the same "subacromial pain syndrome" with a posterior shoulder contracture. Stretching in various forms would be critical to the latter patient, but likely worsen the patient with glenohumeral laxity. Likewise, two patients reporting high pain levels would likely be approached differently if the history and physical examination suggest actual tissue injury in one patient versus high fear avoidance and psychological distress in the other. While a standard "one size fits all" rehabilitation protocol is the cleanest approach in terms of research methodology, [39-43] it is unlikely to yield optimal outcomes unless very similar impairments across all patients can be assumed.

Discussion

The STAR classification system is founded with the pathoanatomic diagnosis, and then is expanded to aid rehabilitation treatment decision-making by classifying the level of irritability and identification of impairments. While we have argued that the rehabilitation classification is essential for guiding specific rehabilitation, we believe the pathoanatomic diagnosis is still an essential element of the process. Consider, for example, 3 patients with a primary impairment of limited glenohumeral mobility attributed to capsular changes. Patient one is 30 years old and 8 weeks post proximal humeral fracture, patient two is 50 years old with early stage adhesive capsulitis, and patient three is 70 years old with chronic pain and stiffness due to glenohumeral

arthritis identified radiographically. The rehabilitation strategy for all three patients would likely be similar, namely to impart physical stress to the glenohumeral joint in the form of active and passive stretching and manual therapy consistent with the stage of irritability. However, the expected time course of recovery and prognosis would likely be very different based on the pathoanatomic diagnosis. Patient one would be expected to recover the majority of range of motion within 3-4 months post injury, while patient two would be expected to recover motion much more slowly over a period of 1-2 years. Patient three may recover motion with rehabilitation but would likely be offered a surgical option of total shoulder replacement if not making satisfactory improvement in 2-3 months. Likewise, a patient labeled as "subacromial pain syndrome" with a known rotator cuff tear might be managed similarly in rehabilitation to a patient with tendinopathy and no tear based upon identified impairments, for example shoulder weakness. However, the patient with a known tear might have a poorer prognosis and be more readily encouraged to explore surgical options if not responding to rehabilitation. Hence, patient management and prognosis could vary substantially based on the pathology present despite having similar impairments. Table 5 summarizes essential features of both the pathoanatomic diagnosis and rehabilitation classification.

We believe post-operative conditions fit nicely within this system. In the post-operative patient, the pathoanatomic diagnosis is quite clear and defined by which tissues have been debrided or repaired as well as the extent of the surgical repair (e.g. small full thickness rotator cuff tear repaired directly versus large or massive cuff tear requiring substantial tissue mobilization). With a known tissue injury and repair, the irritability rating and corresponding intensity of physical stress or protection from stress would be more easily defined by known rates of tissue healing. The early post-operative period would equate to high irritability with

corresponding low levels of physical stress and significant modification of activity. Low irritability and end-stage rehabilitation would occur when the tissue healing is believed to be well established and able to tolerate high levels of physical stress.

There are several potentially attractive features of the proposed STAR-shoulder classification system. While this system was developed to guide rehabilitation of shoulder disorders, we believe the basic system is conceptually simple and could be widely applied to guide rehabilitation of other musculoskeletal disorders in other regions. The concept of tissue irritability is independent of body region; however appropriate operational definitions for high, moderate and low irritability would likely need to be developed for each region. Also, this system has been embraced by a group of experienced clinicians and researchers representing a variety of geographical regions of the United States, each with multiple publications related to shoulder disorders. Likewise we have presented this system on multiple occasions to clinicians nationally and in small groups in a variety of locations with largely positive feedback. Overwhelmingly, the belief is that this classification captures the thought process used by experienced clinicians. Another feature is that the STAR simply expands the current, prevailing pathoanatomic model used almost exclusively in the literature. Therefore it is not separate from the predominant existing medical framework and does not require learning an entirely unique and novel system. Including the pathoanatomic diagnosis in the **system** also facilitates communication within the larger health care community.

There are also several important limitations to the STAR-shoulder classification system. It clearly is only at a conceptual stage and requires systematic research to be refined and validated. Our criteria for irritability stages were only conceived by consensus from a group of experienced clinicians involved in clinical practice and research. The irritability classification is

heavily based on pain reports to estimate the tissue's ability to handle stress, and given the complex nature of pain and potential for central sensitization, this may be problematic. Patients with central sensitization have amplified pain not proportional to tissue injury attributed to changes within the central nervous system. Recently, a consensus document has been produced proposing specific criteria for identifying patients with central sensitization based on clinical examination;[44] patients with this condition may not fit the proposed STAR system well. It is likely that our criteria and operational definitions for each stage will need to be modified and refined. Likewise, it is possible that a mix of features used to define irritability may be present preventing a clean exclusive classification. While ultimately this issue could be addressed by developing well-validated criteria, in the meantime we recommend using the more conservative or higher irritability rating for initial intervention. Other clinically determined features such as the most distal extent of perceived pain or the nature of the end-feel with passive ROM may prove useful in determining irritability level. Currently, the relationships between tissue pathology, symptoms and functional loss at the shoulder are poorly understood.

We have not offered specific operational definitions for each of the impairment categories delineated in Table 4. These definitions need to be developed based on history and clinical examination such that accurate data can be recorded regarding their presence or absence in a specific patient. As more data become available, the categories and key impairments identified in this system may require modification. Likewise, our knowledge about which patients are best candidates for surgical and non-surgical interventions will improve and inform the STAR-shoulder system. Another limitation of the system is that it is focused primarily on physical examination and impairments and does not fully address personal or environmental factors identified in the International Classification of Function (ICF) model. These are

important aspects that often influence treatment decisions or outcome and may ultimately need to be incorporated.

Recommended Next Steps

Several steps are necessary to evaluate, refine and validate the proposed model that we believe are readily achievable over time with a systematic approach and collection of appropriate data. These include:

1. The reliability and validity of the proposed definition for the irritability classification needs to be determined.

2. Standard operational definitions based on patient history and clinical examination procedures need to be developed for accurately identifying each of the proposed impairments delineated in Table 4

3. Specific treatment procedures matched to defined impairments, with operationally defined intensity levels need to be developed such that the type of treatment and intensity can be accurately assessed.

4. The usefulness or validity of the irritability levels and specific impairments classification could be judged in studies comparing outcome in patients who receive matched care (type and intensity of the intervention) to those receiving non-matched care.

5. The actual value (benefit/cost) of utilizing the STAR classification approach needs evaluated. This could be determined by comparing cost of care, including current and

downstream utilization of healthcare for the condition initially treated using the STAR classification, as well as outcomes in patients who receive matched care to those receiving non-matched care.

Summary

Our goal was to propose a testable classification system that is consistent with existing frameworks and current practice while also providing a rehabilitation classification to specifically guide rehabilitation intervention. The proposed system is based on the belief that the pathoanatomic diagnostic model, while helpful, is insufficient for guiding rehabilitation intervention. The proposed model extends the pathoanatomic model by classifying tissue irritability and specific impairments. Tissue irritability is meant to guide intensity of treatment while identifying specific impairments guides specific tactics used for intervention. While applied specifically to shoulder disorders, we believe the model may be useful in classifying musculoskeletal disorders in other body regions. The system is only at a conceptual stage and research is required to evaluate, refine and validate the proposed model.

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Table 1. Potential Red Flag Conditions for the Shoulder (modified from Mitchell 2005)

Potential Condition	History and Examination findings
Tumor	• History of cancer • Symptoms and signs of cancer including unexplained weight loss, pain not correlated with mechanical stress, unexplained fatigue • Unexplained mass, swelling or deformity
Infection	• red skin • fever • systemically unwell
Fracture or unreduced dislocation	• significant trauma • seizure • acute disabling pain • acute loss of motion • deformity or loss of normal contour
Neurologic lesion	• unexplained sensory or motor deficit
Visceral Pathology	• Pain not reproduced with shoulder mechanical stress • Pain or symptoms with physical exertion or respiratory stress • Pain associated with gastrointestinal symptoms • Scapular pain associated with ingestion of fatty foods

Table 2. **Examples of** common pathoanatomic diagnoses based on history and physical examination findings.

	Subacromial Pain Syndrome	Adhesive Capsulitis	Glenohumeral Instability	Other Common Diagnoses
Key Positive Findings "Rule In"	• impingement signs (Neer's, Hawkins, Jobe's tests) • Painful arc • Pain with isometric resistance • Weakness • Atrophy (tear)	• Spontaneous progressive pain • Loss of motion in multiple planes: external rotation most limited • Pain at end-range of motion	• Age usually < 40 years old • History of dislocation or subluxation • Apprehension test • Relocation test • Generalized laxity	• **Post-Operative** • Glenohumeral Arthritis • Fractures • Acromioclavicular Joint • Neural Entrapment • Myofascial pain • Fibromyalgia
Key Negative Findings "Rule Out"	• Significant loss of motion • Instability signs	• Normal motion • Age < 40 years old	• No history of dislocation or subluxation • No apprehension with testing	

Table 4. Common shoulder impairments associated with progressively intensive intervention tactics across a spectrum of tissue irritability

Impairment	High Irritability	Moderate Irritability	Low Irritability
Pain: Associated with Local Tissue Injury	• Activity modification • Manual therapy • Modalities	• Activity modification • Manual therapy • Limited modality use	• No modalities
Pain: Associated with Central Sensitization	• Progressive exposure to activity • Medical Management		
Limited Passive Mobility: joint / muscle / neural tissues	• ROM, stretching, manual therapy: Pain-free only, typically non-end range	• ROM, stretching, manual therapy: Comfortable end-range stretch, typically intermittent	• ROM, stretching, manual therapy: Tolerable stretch sensation at end range. Typically longer duration and frequency
Excessive Passive Mobility	• Protect joint or tissue from end-range	• Develop active control in mid-range while avoiding end-range in basic activity • Address hypomobility of adjacent joints or tissues	• Develop active control during full-range, high level functional activity • Address hypomobility of adjacent joints or tissues
Neuromuscular Weakness: Associated with atrophy, disuse, deconditioning	• AROM within pain-free ranges	• Light or moderate resistance to fatigue • Mid-ranges	• Moderate or high resistance to fatigue • Include end-ranges
Neuromuscular Weakness: Associated with poor motor control or neural activation	• AROM within pain-free ranges • Consider use of biofeedback, neuromuscular electric stimulation or other activation strategies	• Basic movement training with emphasis on quality/precision rather than resistance according to motor learning principles	• High demand movement training with emphasis on quality rather than resistance according to motor learning principles
Functional Activity intolerance	• Protect joint or tissue from end-range, encourage use of unaffected regions	• Progressively engage in basic functional activity	• Progressively engage in high demand functional activity
Poor patient understanding leading to inappropriate activity (or avoidance of activity)	• Appropriate patient education	• Appropriate patient education	• Appropriate patient education

Table 5. Comparison of Features between Pathoanatomic Diagnosis and Rehabilitation Classification

Pathoanatomic Diagnosis	Rehabilitation Classification
Identifies primary tissue pathology	Identifies level of irritability and key impairments
Remains stable across an episode of care	Typically changes over an episode of care
Guides a general treatment strategy • Surgery or Non-operative Care? • Key tissue and movement precautions?	Guides specific rehabilitation intervention • Appropriate intensity of physical stress? • Key impairments driving symptoms and loss of function?
Informs prognosis	May inform prognosis

Figure 1. Overall system for classification incorporating screening, pathoanatomic diagnosis, and rehabilitation classification. The specific pathoanatomic diagnoses shown at level 2 are only given as common examples; these are not meant to represent a complete list. For clarity, pathoanatomic diagnosis and rehabilitation classification are listed sequentially. However, they both are derived primarily from the history and physical examination and, in practice, likely occur in parallel rather than sequentially.
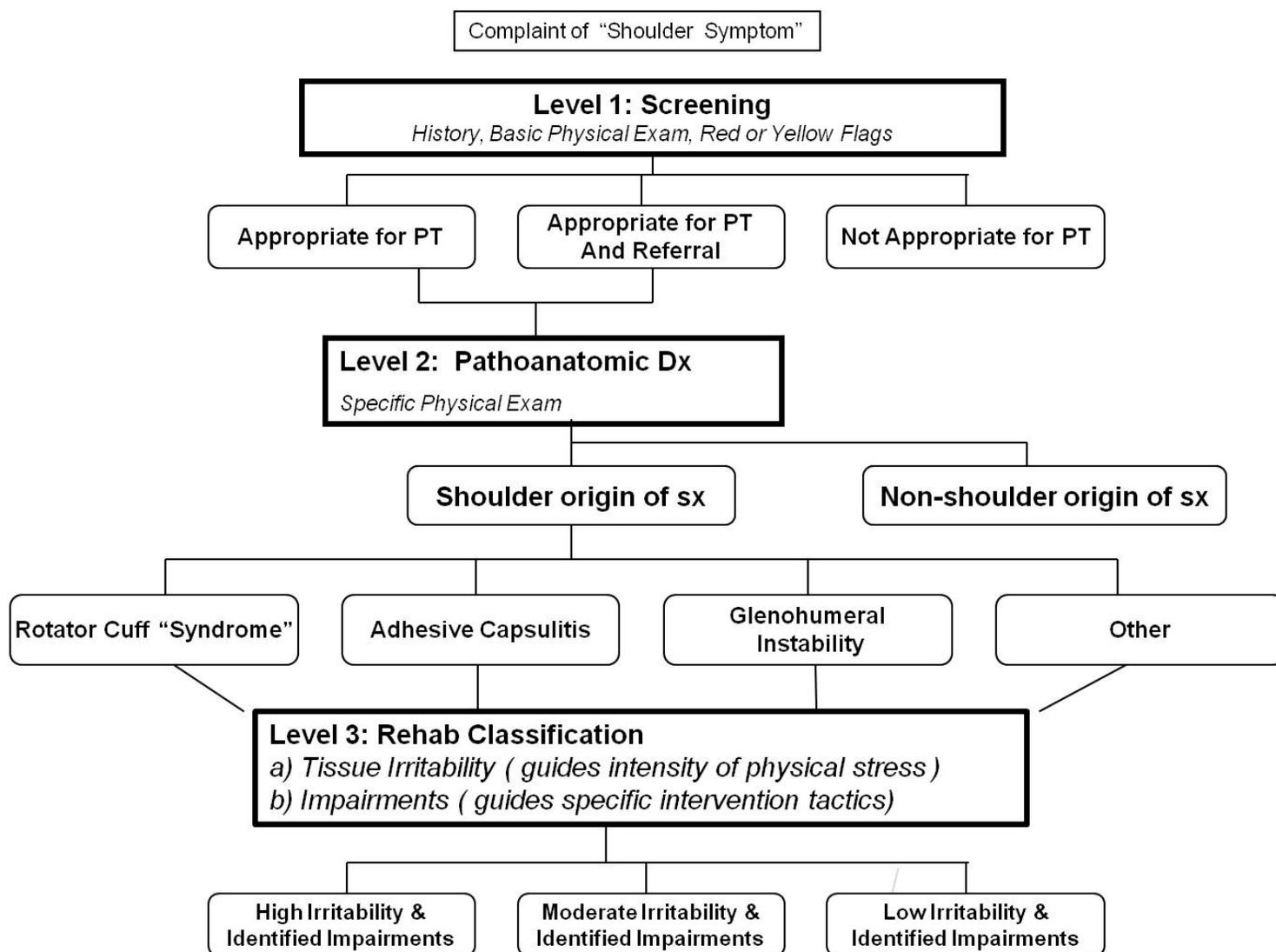
Figure 1

Physical Therapy

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Staged Approach for Rehabilitation Classification: Shoulder Disorders (STAR–Shoulder)
Philip W. McClure and Lori A. Michener
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