

# Prevention Strategies for Activity-related Spinal Disorders Recalibrating Your Clinical Tools



## Presented By:

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*Our mission is the prevention of musculoskeletal and lifestyle-related disorders and disability through education, training and research.*

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**Brief Biography:** Wayne graduated from the Physical Therapy school at Downstate Medical Center – SUNY in Brooklyn in 1975. His early training in Orthopaedics was with Cyriax, Mennell, the ‘Norwegian Approach’, and McKenzie. He developed the Orthopaedic Unit for the PT School at Kean College/UMDNJ, was Clinical Assistant Professor in the PT Dept., Thomas Jefferson University in Philadelphia for many years and an Active Teacher for the American Academy of Family Physicians. He was co-founder of 3 Orthopaedic Study Groups in New Jersey, the Orthopaedic Section for the NJ Chapter APTA (first in the nation) and helped develop the national Orthopaedic Section. He was a founding member of the McKenzie Institute, and selected the first faculty member to replace Robin McKenzie at an International Conference for patient demonstration (Cambridge, England 1995). He is a co-author of the McKenzie Institute credentialing examination, the Part C course, the Physician’s Course amongst many other workshops, activities and accolades for that organization (1982 – 1998). He helped to introduce the Mulligan Method to North America and Europe. Wayne has remained in private practice since 1978. Currently he and his wife (Jean Duffy Rath, PT, Dip MDT) have focused on developing MSD prevention programs that are currently implemented throughout the country. In addition, Wayne provides consultation and treatment for patients that have failed to recover with other conservative and/or surgical interventions. Their home-base of operations is in Syracuse, New York but has recently developed a satellite operation in New York City. Wayne is a Member of the APTA (Orthopaedic Section), North American Spine Society, The International Association for the Study of Pain, and the Human Factors and Engineering Society. In a randomized survey in 2004 Wayne was selected by his peers as one of the top 20 most influential clinicians in Orthopaedic Manual Therapy. A series of continuing education workshops are available beginning with an online pre-requisite course entitled; “Introduction to the Duffy-Rath System©: linking treatment and prevention for musculoskeletal self-efficacy.” More information can be obtained at: [www.duffyrath.com](http://www.duffyrath.com).

**Abstract:** Spiraling healthcare costs, rising rates of chronic spine pain disorders and disability, and the need to focus towards long-term solutions dictates the need for prevention-oriented healthcare strategies. The prevention continuum involves primary, secondary or tertiary strategies. Effectiveness of intervention is demonstrated to be dependent upon: knowledge of the most relevant risk factors for each category, the clinical model utilized, skillful application of tools and customization to the individual. This workshop identifies 4 major clinical tools (assessment, patient education, manual therapy and therapeutic exercise) and demonstrates how to recalibrate the application of these to a preventative strategy. This includes a multidisciplinary review of the literature. The speaker overviews > 25 years of experience in developing prevention strategies in multiple settings and builds a case for Physical Therapy to occupy the leading role in MSD and disability prevention. All “schools of thought” are welcomed and encouraged to identify common factors that help recalibrate differing approaches towards having a long-term, preventative impact in clinical practice.

**Goal:** Promote adoption of a prevention-oriented, long-term approach to the clinical assessment and management of activity-related spinal disorders; helping Physical Therapy to establish a leadership role in prevention of MSD and disability.

**Objectives:**

1. The participant will be able to list at least 4 evidence-based reasons for the need to shift from a treatment-based to a prevention-based clinical strategy for activity-related spinal disorders (ARSD).
2. The participant will be able to correctly define primary, secondary and tertiary prevention and identify risk factors unique to each of the three categories.
3. The participant will be able to identify at least 2 intervention factors that focus their clinical approach either towards or away from a prevention strategy with 4 intervention tools: clinical assessment, patient education, manual therapy and therapeutic exercise.
4. The participant will be able to list 4 evidence-based factors that contribute to chronic back or neck pain disability and identify a preventative action for each.

**Definition of Key Terms**

**Primary prevention** – actions and behaviors taken to improve or maintain people’s health and function (well-being) prior to onset of a disease, illness or to mitigate risks for injury.

**Secondary prevention** – actions and behaviors taken in early stages of a disease, illness or injury that facilitate complete recovery, and mitigate risks for recurrence.

**Tertiary prevention** – actions and behaviors taken after a disease, illness or injury is fully established to minimize consequences and mitigate risks for disability.

**Quaternary prevention** – methods to mitigate or avoid results of unnecessary or excessive interventions in the health system.

**Iatrogenesis** – the inadvertent adverse effect or complication resulting from treatment and/or advice of a healthcare practitioner(s). Regarding ARSD this includes a health-related disorder, disease, impairment or disability generated or exacerbated as a result of the treatment, advice and/or model utilized in providing care to the patient.

**Activity-related Spinal Disorders (ARSD)** – mechanical back and neck pain disorders related in onset to lifestyle, ADL and/or accidents; excludes medical, systemic and other non-mechanical causes (e.g. systemic inflammatory disease, infections, congenital anomalies, metastatic disease etc.)

**Assessment** - the subjective, objective and functional processes utilized to identify the patient's symptoms and signs, develop the musculoskeletal diagnosis or classification that guides intervention strategy and selection of treatment tools, and measures the response to determine effectiveness.

**Directly relevant sign** – an examination or functional sign that reproduces or reduces the symptoms associated with a patient's MSD; i.e. directly affects their symptoms.

**Indirectly relevant sign** - examination or functional sign that does not reproduce the patient's symptoms, but adversely affects ability to control their symptoms and restore normal activity levels and function.

**Patient education** – instruction and training given to the patient during clinical management of their musculoskeletal disorder; includes the theoretical basis for shared decision making and self-efficacy.

**Manual therapy** – 'hands-on' procedures used to restore motion, function and/or relieve pain.

**Therapeutic exercise** – exercise and activity used to achieve a specific clinical goal relevant to control of signs, symptoms and/or the restoration of physical function; i.e. safe and acceptable activity tolerance.

**Biomedical model** – a disease, pathology based model that emphasizes the importance of establishing a specific (medical) diagnosis that is required to identify a specific treatment and cure.

**BioPsychoSocial model** – a healthcare model based upon identifying and addressing the combined effects of biologic, psychological and social factors affecting human function in the context of disease, illness or injury.

**Musculoskeletal self-efficacy** – an individual's belief, ability and confidence to control their musculoskeletal health and physical performance capability when confronted with a musculoskeletal problem(s).

**Common factors theory** – theory of generic factors that contribute to outcome variance in patient treatment; developed in psychotherapy but applies to treatment of ARSDs.

**Duffy-Rath System© (DRS) 5 Core Prevention Elements** – 1) Good biomechanical habits, 2) Effective management of fatigue and warning signals, 3) Healthy (adequate) ROM, 4) Strategic strength and conditioning, and 5) Positive attitude for musculoskeletal self-efficacy.

**Tools To Fight Back® (TTFB®)** – actions and behaviors that facilitate musculoskeletal health and function. In treatment these tools consistently control signs and/or symptoms and facilitate recovery of function; in prevention these tools facilitate successful application of the 5 core elements.

**Self-determination Theory (SDT)** - an empirical theory in psychology related to those intrinsic and extrinsic factors and influences of human behavior that are self-motivated and self-determined.

**Disability** – legal designation of impairment in ability to function. This does not necessarily correlate to degree of impairments, or intensity of pain.

**Impairment** – the observable, measureable (objective) loss of ability to function. This is not synonymous with, nor does it necessarily result in disability.

**Functional Demand Evaluation (FDE)** – this is an objective process to identify the essential functional tasks (EFT) for a job title and measure the physical demands for each of the EFT. This is also called a “functional job description”.

**Job Matching Evaluation (JME)** - this is the process of measuring the physical ability of the worker to meet the physical demands of a job title as identified in a validated FDE safely and acceptably. This is sometimes called a “post-offer physical abilities test”; it is essentially an abbreviated FCE specific to the results of the FDE with the intent of helping to reduce the risk for injury.

**Physical Demand Characteristics (PDC) Groups** – a 5-category system adopted by the US Dept. of Labor that ranks the physical demands of occupations and job tasks; developed by Leonard Matheson, PhD. This concept can be applied to the physical demands of an individual’s lifestyle with the intent of designing a prevention strategy that sustains the ability to meet these demands safely and acceptably. The PDC groups are defined as follows:

| <b>PDC Group</b>  | <b>Occasional</b><br>0 - 33 % of work day | <b>Frequent</b><br>34 – 66 % of work day                      | <b>Constant</b><br>67 – 100 % of work day                          | <b>Typical Energy Required</b> |
|-------------------|-------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------|
| <b>SEDENTARY</b>  | 10 lb.                                    | Negligible                                                    | Negligible                                                         | 1.5 - 2.1 METS                 |
| <b>LIGHT</b>      | 20 lb.                                    | 10 lb.<br>and/or walk/stand/push/<br>pull of arm/leg controls | Negligible<br>and/or push/pull of arm/leg<br>controls while seated | 2.2 - 3.5 METS                 |
| <b>MEDIUM</b>     | 20 – 50 lb.                               | 10 - 25 lb.                                                   | 10 lb.                                                             | 3.6 - 6.3 METS                 |
| <b>HEAVY</b>      | 50 – 100 lb.                              | 25 - 50 lb.                                                   | 10 - 20 lb.                                                        | 6.4 - 7.5 METS                 |
| <b>VERY HEAVY</b> | Over 100 lb.                              | Over 50 lb.                                                   | Over 20 lb.                                                        | Over 7.5 METS                  |

**Physical demand mismatch** – the situation where the physical demands of an individual’s job, home or recreational activities are greater than their safe and acceptable ability. This applies to multiple domains of physical function, including but not limited to: ROM, strength, endurance, coordination, balance, fine motor, sensibilities etc.

## **Introduction and Background**

Today's workshop addresses the need to shift the focus of healthcare for activity-related spinal disorders (ARSD) to prevention-based strategies, and how Physical Therapy has taken a leading role in this effort. This has been the focus of my practice for almost 30 years now; my wife (Jean Duffy Rath, PT, Dip MDT) and I have developed a systematic approach to this concern called the; 'Duffy-Rath System®'. In today's session I draw upon our experience, a review of the literature and a dissection of 4 major musculoskeletal treatment tools to illustrate how the patient/care-giver relationship has a positive, negative or non-effect for prevention of these common musculoskeletal disorders (MSD). The intent is to encourage you to evaluate your treatment approach from this perspective, and when needed 'recalibrate your clinical tools' to a prevention-oriented strategy.

The 4 major tools addressed today are: 1) assessment (and reassessment) processes, 2) patient education and training, 3) manual therapy, and 4) therapeutic exercise. The combined use of these tools enhances a positive effect on treatment outcomes (Evans 2002; Wand 2004; Balthazard 2012; JOSPT Perspectives for Patients 2013) – a Gestalt-like effect. These tools are the foundation for most conservative care treatment strategies for ARSDs. The questions at hand are: how does your treatment plan (comprehensively) address the patient's long-term management of their back or neck pain issue, and how does physical therapy move to interventions and actions before onset or recurrence.

The recalibration of our tools occurs in one of three phases of the prevention continuum: 1) primary prevention – before the onset of a back or neck pain problem, 2) secondary prevention – early after onset to facilitate rapid and complete recovery with a focus to prevention of recurrence, and 3) tertiary prevention – after the condition is established, not rapidly or completely reversible to minimize consequences going forward. However, there is fourth prevention concern that is a serious and growing issue in musculoskeletal healthcare identified by the World Health Organization; i.e. quaternary prevention (Deyo 2009; Pranksy 2011). This involves avoiding and/or mitigating iatrogenic factors that contribute to chronic spine pain and disability. We encourage and need all individual healthcare providers and their collective professions to understand this issue and actively facilitate practices that counter this concern.

**Scope of the Problem** - Back and neck pain is ubiquitous, a human experience not unlike the common cold or headache. Activity-related spine pain is one of the most common reasons a person seeks medical consultation. The problem is typically benign and transient, but occasionally serious and significantly consequential – there is certainly evidence of over-treatment for the nonspecific group (Hadler 2009). LBP alone accounts for 2% of all physician office visits; only routine exams, hypertension and diabetes generate more visits (Deyo 2006). Martin et. al. (2008) found that the mean age and sex adjusted medical costs for back and neck pain increased 65% from 1997 to 2005 (i.e. more rapidly than all other healthcare expenditures) while simultaneously self-reported physical functioning limitations related to these disorders increased from 20.7% to 24.7%. The healthcare system is failing to solve the back and neck pain problem; in some instances making it worse.

LBP accounts for 50% of all physical therapy outpatient treatment visits (Flynn 2008). In 2006 44.4 million patients visited a physician with back pain; direct annual medical cost estimates were \$30.3 billion and indirect costs \$14 billion for lost wages (Jacobs 2011). Activity-related back and neck pain has been recognized as the most common cause of disability and limited activity in young and middle-aged adults for decades now (Spitzer 1987; Bigos 1994) – this status remains unchanged today.

The focus needs to shift to prevention of onset, recurrence and consequence of these common, lifestyle-related disorders – the prevention continuum. We propose that healthcare is primary prevention by definition (Rath 2002); treatment is illness care with the intention of restoring health (and function). It is secondary prevention when implemented early and/or the condition is fully reversible; this is highly probable with nonspecific back and neck pain disorders provided relevant risk factors are identified and controlled. Treatment becomes tertiary prevention when implemented after structural pathology and/or damage has occurred that is not fully reversible. Quaternary prevention must be exercised at all times. In this workshop we address the influence of the clinician’s approach to the long-term health and function of their patients and share our [Duffy-Rath] experiences in transitioning to a prevention-based practice.

**Prevalence and Risk Factors** - The US National Center for Health Statistics (2010) identifies a 3-month prevalence of 29.1% for low back pain and 15.1% for neck pain. Lifetime prevalence is within the 70 – 90% range. Case definitions influence the results significantly. For example, the reported prevalence of sciatica ranges from as low as 1.2% to as high as 43% (Konstantinou and Dunn 2008). When using strict definitions for radicular pain and radiculopathy the lifetime prevalence for sciatica is 2% with 10-25% of these developing persistent radiculopathy (Wise and Andersson 2001). Cervical radicular pain is equally infrequent with an age adjusted incidence of 83.2 per 100,000; 107.3 for males and 63.5 for females, with a peak incidence between 50 – 54 years (Radhakrishman et. al. 1994). The overwhelming majority of neck and back pain disorders have local and/or referred symptoms and fall into the nonspecific group – this is critically important for all 4 phases of the prevention continuum, especially quaternary.

Risk factors are biopsychosocial in nature and require a comprehensive, multidisciplinary approach to prevention (Nagasu 2007). The most common physical risk factors we address as physical therapists involve posture, body mechanics and physical demand mismatches (Ferguson 1997; Burdorf 1997; NIOSH 1997; Toepfen-Sprigg 2000, Kuiper 2005) – solutions for these risk factors are addressed in the first 4 core elements of our system.

Risk factors for chronic pain and disability tend to be more psychosocial than physical. These include depression, fear avoidance behaviors, poor coping skills, catastrophizing, low socioeconomic status, job dissatisfaction etc. An example is a recent study looking at the association of stress factors, labeled “work-life conflict” (WLC), found a five-fold increase in prevalence and a six-fold increased relative risk for MSD for those with conflicts (Hämmig et. al. 2011). The table below lists a select group of studies that have identified risk factors for chronic

musculoskeletal pain and disability. Our 5<sup>th</sup> core element recognizes the importance of these factors and finding methods to overcome the barriers.

A selection of studies and systematic reviews looking at risk factors for chronic musculoskeletal pain and disability indicate that psychosocial issues predominate and need to be identified and addressed with prevention strategies.

| Study                                                     | Design                                                   | Population                                         | Risk Factors                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Armenian et. al. Am J Epidem. 148 (3) 1998                | Population-based Cohort                                  | 1,920 patients<br>1,715 control                    | Major depression was a significant risk factor for chronic physical illness and disability.                                                                                                                                                                                                                                                                          |
| Picavet et. al. Am J Epidem 158 (11) 2002                 | Population-based Cohort                                  | 1,571                                              | Follow-up found kinesophobia to predict LBP and disability even when there were no symptoms/problems at original survey.                                                                                                                                                                                                                                             |
| Pincus et. al. Spine 27 (5) 2002                          | Sys review                                               | 25 publications (18 cohorts)                       | Distress, depressive mood and somatization are predictors. Need to address coping strategies and fear avoidance to prevent disability.                                                                                                                                                                                                                               |
| Denison et. al. Pain 111 (3) 2004                         | Small component of Prospective Cohort                    | Two samples:<br>n1 = 210<br>n2 = 161               | Self-efficacy and fear avoidance more predictive of disability than pain intensity and pain duration.                                                                                                                                                                                                                                                                |
| IJzelenberg et. al. Spine 30 (13) 2005                    | Longitudinal with 6-mo follow-up                         | 505 workers<br>407 (81%) at follow-up              | Older age and living alone predictive for LBP disability.<br>Living alone and female predictive of neck/upper extremity disability.                                                                                                                                                                                                                                  |
| Sivertsen et. al. Am J Epidem 163 (11) 2006               | Population-based Cohort                                  | 92,100                                             | Insomnia is a strong predictor of disability; independent of socio-demographic and shift-work status.                                                                                                                                                                                                                                                                |
| Mallen et. al. Br J Gen Prac 57 (541) 2007                | Systematic review (Observational cohort in primary care) | 45 studies identified for review                   | 11 factors found to be associated with poor outcome with musculoskeletal pain: higher pain severity, longer pain duration, multiple-site pain, previous pain episodes, anxiety and/or depression, higher somatic perceptions and/or distress, adverse coping strategies, low social support, older age, higher baseline disability and greater movement restriction. |
| Ropponen et. al. Scad J Pub Health 39(8)2011              | Twin Cohort Study                                        | 24,043 over 30 years                               | Risk for disability due to MSD/OA predicted by comorbidities, educational level and social class.                                                                                                                                                                                                                                                                    |
| Ropponen et. al. Scand J Pub Health 39 (8) 2011           | Population-based                                         | 1,387,166 men born bet 1951 - 1976                 | Hand grip/body weight ratio is strongly and inversely associated with pension disability due to MSD later in life.                                                                                                                                                                                                                                                   |
| Gjesdal et. al (BMC Musculoskeletal Disorders Feb 7, 2011 | Prospective Cohort (Norway)                              | 37,942 woman<br>26,307 men<br>> 8 weeks sick leave | Woman at greater risk for disability than men. Socioeconomic status (lower income) increased risk. Diagnosis of myalgia/fibromyalgia > OA had poorer prognosis. Back pain and non-traumatic UE disorders = 50% of cases.                                                                                                                                             |

Comorbidity and psychological stress are highly relevant concerns in managing musculoskeletal pain, especially in regards to prevention of disability and chronicity. A recent study has implicated a high BMI ( $\geq 30$ ) as an increased risk of developing chronic low back pain (Heuch 2013) – there is a multitude of studies that implicate the association of comorbidity with ARSD and the need for treatment approaches to address a larger, lifestyle concern for the patient’s long-term health and function. Many of these chronic illnesses can be managed effectively and prevented through exercise science (Booth 2000; 2002) – two or more “birds with one stone”.

**The Intervention Model Matters** - The classic, pathology-based [biomedical] model has failed to solve the back and neck pain dilemma for a variety of reasons. This includes the fact that most cases are nonspecific, there has been an over reliance on diagnostic imaging that has major problems with accuracy (e.g. high false positive rates), the need patient needs to be included in the clinical management process, and the context of each patient’s problem needs to be understood for successful resolution. Additionally, when and how do you measure the success of treatment? It is important to have objective evidence of improvement at the termination of care, but ultimately the long-term impact is more important.

The biopsychosocial model incorporates the need for evidence-based diagnosis or classification, but includes analysis and actions relevant to the psychological and social context of the problem unique to each patient. Furthermore, this model allows for consideration of the impact of the care-giver on the effectiveness and efficiency of outcome and potential long-term consequences of the ‘professional’s’ opinion and philosophy. The importance of the linkage of many relevant factors is captured in a new conceptual model for neck pain presented in the Neck Pain Task Force published in Spine (Guzman et. al. 2008); i.e. “Linking Onset, Course, and Care’. I recommend clinicians treating ARSD to become familiar with this important publication; it represents an evolution of the Quebec Task Force Reports (Spitzer 1987, 1995) and provides clinicians with an excellent ‘big picture’ perspective.

**Elements of the 2008 Neck Pain Task Force Conceptual Model** - The task force was a collaboration of experts in many disciplines and included an exhaustive search and analysis of scientific evidence related to onset, management, prevention and consequence of activity-related neck pain disorders. The process for developing a new conceptual model included 6 premises:

|                     |                                                                                                           |
|---------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Premise # 1:</b> | The primary perspective of the neck pain task force is to people with or at risk of developing neck pain. |
| <b>Premise # 2:</b> | Neck pain is an episodic occurrence over a lifetime with varying degrees of recovery between episodes.    |
| <b>Premise # 3:</b> | Onset and course of neck pain is affected by multiple factors.                                            |
| <b>Premise # 4:</b> | Management and subsequent course of neck pain depends on options available and how they are appraised.    |
| <b>Premise # 5:</b> | The impact of neck pain on an individual can be described within various domains.                         |
| <b>Premise # 6:</b> | Linkages between factors and impacts can occur in multiple directions.                                    |

The task force identifies 5 major components relating to neck pain disorders that need to be assessed, all of which must be understood within the context of the individual patient’s environment (i.e. bio-psycho-social-economic milieu). These five major components are: 1) Factors affecting the onset and course of neck pain, 2) The “care” complex, 3) The “participation” complex, 4) The “claim” complex, and 5) The impact and outcomes of neck pain.

The task force developed a new, 4-grade, classification system for neck pain and associated disorders. This addressed three broad categories and actions to be taken: 1) no neck pain (primary prevention), 2) non-interfering neck pain and 3) interfering neck pain. However this was

too simple to group the analysis of published articles and scientific evidence. A 5-axis classification system to group the evidence: 1) the source of subjects and data, 2) the setting or sampling frame, 3) the severity of neck pain and its consequences, 4) the duration of neck pain, and 5) its pattern over time. This ultimately led to a 4-grade classification system that is similar to the Quebec Task Force one in 1995:

1. **Grade 1 neck pain** – no signs or symptoms of major structural pathology (i.e. fracture, vertebral dislocation, injury to spinal cord, infection, systemic disease due to inflammatory arthropathies etc.) , and no or minor interference with ADL.
2. **Grade 2 neck pain** - no signs or symptoms of major structural pathology, with major interference with ADL.
3. **Grade 3 neck pain** - no signs or symptoms of major structural pathology, but presence of neurologic signs.
4. **Grade 4 neck pain** – signs or symptoms of major structural pathology.

The task force also developed a secondary grading system for those neck pain patients who have a claim; those who see a steady stream of workers compensation and medical-legal cases know these factors can impact treatment planning, utilization and outcome:

1. **Grade 1** – neck pain with claim for reimbursement of primary health care or car and equipment repair only.
2. **Grade 2** - neck pain with claim for reimbursement of secondary/tertiary care or temporary wage replacement.
3. **Grade 3** - neck pain with claim for long-term disability.
4. **Grade 4** – neck pain with claim for permanent disability or punitive damages for pain and suffering.

The entire 2008 Neck Pain Task Force report is a comprehensive resource that directs healthcare to an improved system and strategies to manage the short and long-issues of these common MSDs. It wholly integrates the biopsychosocial model; the document identifies the distinct possibility that the care-giver can have a positive or a negative influence on the patient's short and long-term response to treatment. Iatrogenesis is recognized as a problem; a subject the Duffy-Rath System© has been acutely aware of and attempting to prevent in its sphere of influence.

Iatrogenic causes of back and neck pain disorders and disability are a growing problem - Pransky et. al. (2011) attributes the problem to the "LBP medical industrial complex". This makes the intervention model that much more important. Physical therapy can play a major role in

combating this trend by becoming the first choice for treatment, but only if the predominate strategies for patient care are individualized, activity (function) oriented with a positive long-term focus and efficiently recognized those patients who are not responding and either change strategy or refer to get help.

Examples of emerging evidence for this include superior outcomes with conservative (non-operative) treatment for work-related degenerative LBP disorders when compared to spinal-fusion surgery (Deyo 2004). Nguyen et. al. (2011) found active conservative treatment of workers compensation patients with LBP to be far superior to fusion; 67% of the non-op patients RTW whereas only 26% of the fusion patients did – 11% of the fusion patients were permanently disabled compared to only 2% of the non-op patients. Wand et. al. (2004) found that the combined effect of biopsychosocial education, manual therapy and exercise was an excellent tool for secondary prevention – the study supports the assess-advise-treat model, for waiting to initiate treatment did not achieve the same benefits. A recent and important study found that early referral to active, evidence-based physical therapy was not only effective but associated with a reduced need for future healthcare (Fritz 2012) – the case for PT as the gate-keeper for ARSD is building.

**Onset and Injury: These are Lifestyle-related “Conditions”** - The mechanism of onset for the majority of ARSD is lifestyle-related, there is either no specific injury or the problem develops while performing a normal ADL; e.g. bending over to lift, waking up from sleeping, reaching for something etc. To get to root cause(s) for both treatment and prevention lifestyle factors have to be addressed – otherwise the effect of the intervention is indirect, symptom focused and prone to mislead.

Less than 10% of the cases are the result of trauma – but even these cases need to address lifestyle factors to optimize quality of repair, achieve full recovery and prevent recurrence. The table below identifies the mechanism of onset for ARSD in one of our outpatient clinics; these results have been replicated many times before and after – in our experiences.

| <b>Mechanism of onset study:</b> we performed a prospective study of the mechanism of onset for 1,326 consecutive patients referred to one of our onsite industrial clinics. The mechanism for onset was placed into one of 4 groups following operative definitions: 1) NIE – no specific incident or event, 2) Incident A – performing a normal ADL (e.g. sitting, bending over, lifting something normal, reaching etc.), 3) Incident b – a sudden, unguarded force with a normal ADL (e.g. slipped walking but did not fall, lowering a box and it slipped and tried to catch it etc.), and 4) Trauma – car accident, fall, struck by something etc. The 5 <sup>th</sup> group was for those were the onset was not listed (i.e. unknown) or not applicable to the reason for PT consultation. |            |            |            |            |             |                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------|-------------|---------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | NIE        | Incident A | Incident B | Trauma     | Total       | Unknown or Not Applicable |
| <b>Overall</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>690</b> | <b>345</b> | <b>128</b> | <b>158</b> | <b>1316</b> | <b>10</b>                 |
| %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 52.4       | 26.2       | 9.7        | 12.0       |             |                           |
| <b>Work-related</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>462</b> | <b>295</b> | <b>109</b> | <b>103</b> | <b>967</b>  | <b>6</b>                  |
| %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 47.8       | 30.5       | 11.3       | 10.7       |             |                           |
| <b>Not Work-related</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>228</b> | <b>50</b>  | <b>19</b>  | <b>55</b>  | <b>349</b>  | <b>4</b>                  |
| %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 65.3       | 14.3       | 5.4        | 15.8       |             |                           |
| <b>Low back</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>165</b> | <b>144</b> | <b>18</b>  | <b>17</b>  | <b>344</b>  | <b>2</b>                  |
| %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 48.0       | 41.9       | 5.2        | 4.9        |             |                           |
| <b>Neck</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>102</b> | <b>43</b>  | <b>6</b>   | <b>7</b>   | <b>158</b>  | <b>0</b>                  |
| %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 64.6       | 27.2       | 3.8        | 4.4        |             |                           |

|                 |           |           |          |          |           |          |
|-----------------|-----------|-----------|----------|----------|-----------|----------|
| <b>Mid-back</b> | <b>13</b> | <b>16</b> | <b>2</b> | <b>3</b> | <b>34</b> | <b>0</b> |
| %               | 38.2      | 47.0      | 5.9      | 8.8      |           |          |

There is another consideration relevant to the mechanism of onset – the label itself. The concept of an injury can facilitate negative perceptions related to victimization and blame, leading to a sense of helplessness that can be disabling. Add to that a negative diagnostic experience where the patient is told they have something horribly wrong with their spine and pessimism is fertilized. Considering that 90% of the cases are nonspecific this is unwarranted; and for those with unequivocal pathology the long-term expectations are positive with the right combination of treatment, action and behaviors. One of the conclusions at the 10<sup>th</sup> International forum for primary care research in LBP was that there is an advantage to patients [and practitioners] that view LBP as a condition rather than a disease (Pransky 2011). Hadler has been advocating this for nearly 40 years.

**Factors Contributing to Overtreatment (Fighting Iatrogenesis)** - There are many factors that contribute to overtreatment of ARSD. These include; misdiagnosis, passive treatment, discouraging activity (intentionally or unintentionally), medicalization of minor activity-related conditions, rigid use of a clinical model (school of thought) in spite of evidence that it's not working, failure to recognize and address adverse psychosocial factors, not communicating with the workplace, and not looking to the patient's long-term well-being etc.

Nordin (2001) provides an excellent overview of factors that can delay recovery with occupational LBP – she stresses the therapeutic value of activity and return to work. These are referred to as 'Yellow Flags' in the literature; another excellent overview is found in the 'New Zealand Guide for Management of Acute Low Back Pain' (ACC 1997). Fifty factors are identified that are divided into 7 groups: 1) attitude and beliefs, 2) behaviors, 3) compensation, 4) diagnosis and treatment, 5) emotions, 6) family and 7) work issues. All physical therapists caring for patients with ARSD should be familiar with each of these and how they might affect treatment outcomes.

Overtreatment is another way of saying that the intervention(s) was both ineffective and inefficient; more time, energy and capital did not yield an improved clinical outcome. This is a metastatic problem within the American healthcare system; the management of ARSD has (unfortunately) been exemplary of this (Martin 2008). The combined effects of a lack of both effectiveness and efficiency has led to the creation of various 'managed care' attempts that exert progressive control over providers by health insurance companies and governmental agencies. Costs have shifted away from the providers and into the pockets of the insurers and the incredible number of 'middle-men' that have sprouted along the way – yet costs continue to rise and outcomes have not improved. There is a systemic problem that merits a 'deep dive' investigation by each profession.

However, each individual clinician and organization can attempt to do their best to provide both effective and efficient care. Effectiveness of treatment is measured with evidence-based outcome tools; this has been known and advocated for many years (Jette 2009). Efficiency is

measured by the amount of time and resources required to achieve the outcome; i.e. the number of visits, length and cost of the treatment. Overtreatment occurs when increasing time and expense is not associated with optimal outcomes – the exact situation our healthcare system is in currently.

Ongoing outcome assessment and utilization review are effective methods to insure efficiency relative to outcome. Clinicians may not be comfortable with continuous performance assessment at first, but usually come around to appreciating the value of objective assessment as a tool for professional growth. The tables below illustrate patterns of patient response that demonstrate both effectiveness and efficiency of MSD treatment services.

**Spine Center Study:** 319 consecutive patients with ARSD treated at our NJ clinic; 112 low back, 42 neck, 9 mid-back and 11 combination. Using the Quebec Task Force definitions, most of the patients were chronic (> 7 weeks): 63.7% chronic, 26.9% subacute and 9.4% acute. Responders were ranked as having an excellent, good or fair outcome based upon improvements in pain and functional self-ratings and return to activity (i.e. fair meets minimally important change). Non-responders are poor outcomes (Rath et. al. 1993 – unpublished data).

|                  | #   | %    | Mean Visits | Mean Weeks |
|------------------|-----|------|-------------|------------|
| <b>Excellent</b> | 174 | 54.5 | 6.3         | 5.1        |
| <b>Good</b>      | 95  | 29.8 | 7.5         | 6.1        |
| <b>Fair</b>      | 27  | 8.5  | 5.1         | 3.7        |
| <b>Poor</b>      | 23  | 7.2  | 2.3         | 1.1        |

**Spine Center Study Continued:** The most significant impact on outcome was the presence of radiculopathy and to a lesser degree the patient being inactive (e.g. unable to work) because of their ARSD.

|                       | Excellent | Good  | Fair | Poor | Mean Visits | Mean Weeks |
|-----------------------|-----------|-------|------|------|-------------|------------|
| Overall               | 54.5%     | 29.8% | 8.5% | 7.2% | 6.7         | 5.6        |
| QTF 1                 | 74.4      | 20.7  | 4.1  | 0.8  | 4.6         | 3.3        |
| QTF 2                 | 59.0      | 36.1  | 3.3  | 1.6  | 5.0         | 5.5        |
| QTF 3                 | 46.4      | 38.1  | 10.7 | 4.8  | 7.1         | 7.2        |
| QTF 4 (Radiculopathy) | 16.9      | 30.2  | 20.8 | 32.1 | 7.1         | 4.8        |
| Acute (< 7 days)      | 73.3      | 20.0  | 0    | 6.7  | 4.7         | 2.4        |
| Subacute (1-7 wks)    | 66.3      | 22.1  | 4.7  | 6.9  | 5.0         | 3.2        |
| Chronic (> 7 wks)     | 46.8      | 34.5  | 11.3 | 7.4  | 7.1         | 6.1        |
| Active at IE          | 59.2      | 29.6  | 5.8  | 5.4  | 5.2         | 4.4        |
| Idle at IE            | 41.0      | 29.5  | 16.7 | 12.8 | 9.8         | 6.8        |

QTF 1 = local pain only; QTF 2 = local + prox. limb pain; QTF 3 = local + distal limb pain; QTF 4 = Radicular signs (QTF 1-3 = nonspecific disorder)

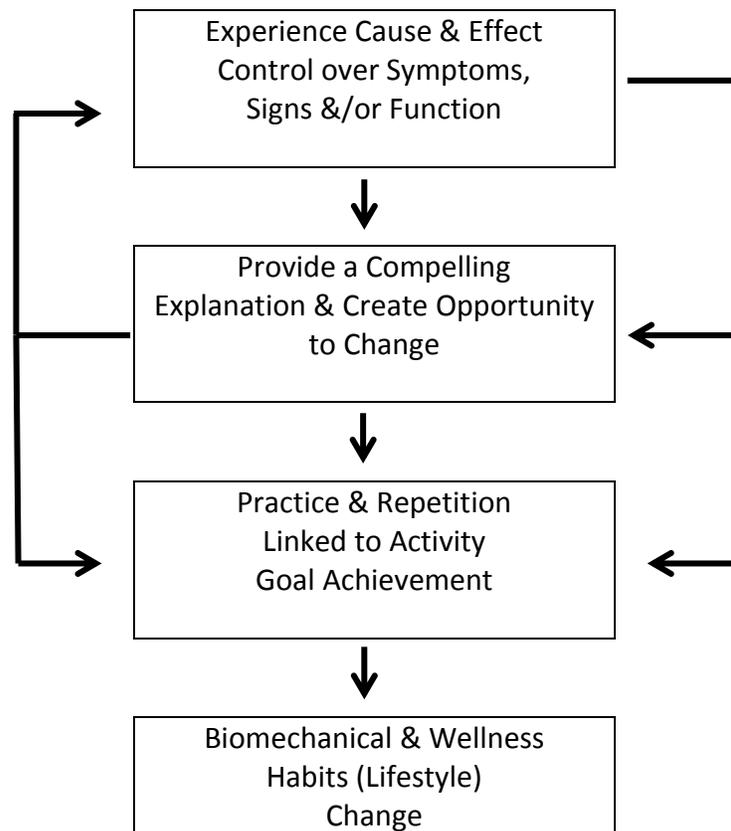
**Multi-center Study:** Preliminary report of outcome findings with a consecutive case-series investigation (N = 166) with 7 clinicians completing the Duffy-Rath certification system indicating reproducibility of effectiveness and efficiency (Rath et. al. 2008 – unpublished data).

| Outcome          | #  | %    | Pain Rating IE (0 – 10) | Pain Rating DC (0 – 10) | Disability Rating IE (0 – 10) | Disability Rating DC (0 – 10) | Visits | Weeks |
|------------------|----|------|-------------------------|-------------------------|-------------------------------|-------------------------------|--------|-------|
| <b>Excellent</b> | 65 | 39.2 | 4.97                    | 0.3                     | 40.0                          | 5.8                           | 6.6    | 4.1   |
| <b>Good</b>      | 54 | 32.5 | 5.9                     | 1.7                     | 46.9                          | 15.6                          | 7.3    | 4.4   |
| <b>Fair *</b>    | 39 | 23.5 | 5.7                     | 3.7                     | 56.4                          | 41.8                          | 9.0    | 5.0   |
| <b>Poor</b>      | 8  | 4.8  | 4.8                     | 6.0                     | 55.7                          | 58.2                          | 4.9    | 3.1   |

\* met criteria for minimally important change

As previously mentioned, we can fight overtreatment and iatrogenesis in many ways; ultimately by utilizing our clinical skills in a positive and empowering way to address the most relevant clinical and risk factors individual to each patient. And, when the patient is not responding change strategy or get help; stop trying to ‘put a square peg in a round hole’.

**Facilitating Musculoskeletal Self-efficacy** - Only a small percentage of people who experience a low back or neck pain episode seeks treatment; most people self-manage or simply allow the problem to run its course. It would seem to make sense that those who seek treatment must have more serious pathological problems; although true sometimes, the majority of patients who seek treatment have nonspecific problems. The inability to find ways to cope effectively with their problem is a common factor with many who become patients. Our job includes identifying the most relevant factors and arming the patient with the skills, knowledge and ability to overcome their problem (i.e. the Tools To Fight Back®). These tools include; awareness, psychomotor and cognitive skills to confront their problem. The model we use in attempt to empower the patient and build their musculoskeletal self-efficacy is as follows:



Ultimately the target is prevention of adverse consequences that can result from the back or neck pain; some pain is unavoidable, but consequences leading to impairment and disability usually are. Converting the experience into a positive teaching tool is the trick. Our philosophy has always been that; “the presence of a problem is an opportunity for a solution”. The cycle

needs to be positive and reinforcing; rather than a ‘negative’ spiral. This applies to primary, secondary and tertiary prevention strategies – this positive, empowering approach needs to be reflected in the assessment-treatment-prevention continuum (below).



## Analyzing Your Clinical Tools: Recalibrate When Needed

This section of the workshop directly addresses the 4 major clinical tools with a focus to analyzing how your approach can facilitate or inhibit a prevention-based strategy. I use clinical examples from our approach and experience, but attempt to find the ‘common factors’ that apply to all approaches or ‘schools of thought’ relevant to the prevention continuum.

Schools of thought are important for clinicians to develop confidence in developing treatment plans for their patients. However no school of thought is clearly superior to all others, nor is there one that applies to the entire spectrum of possible patient problems. Schoolism becomes a problem when the belief and approach becomes too rigid, dogmatic and/or over applied. These are natural tendencies when one becomes passionate in their approach – however this needs constructive containment and direction. It is important to remain respectful and open-minded to other approaches (i.e. opportunities to learn); look for common factors as there are many with the most popular schools; evaluate the utility of procedures and processes in context of the patient’s long-term health, wellness and function.

### Tool # 1: The Assessment Process

Treatment and prevention of back and neck disorders starts and ends with the assessment process. The initial assessment influences our conclusions, choice of treatment strategy and procedures; ongoing assessment indicates whether or not the patient is responding and their degree of recovery. How we construct and implement this process has a positive, negative or equivocal effect on the patient’s long-term habits and behaviors. Ultimately the patient must self-assess in order to remain active, healthy and able. Those of us who do this naturally do not seek treatment for ARSD.

Keep the history and examination simple, focused and evidence based. Reassure the patient appropriately, reinforce the importance of remaining active through recovery, avoid negative language and labels, rank the relevancy of the signs and symptoms as to impact on function on activity-tolerance, and include the patient in decision-making. Think of yourself as the ‘coach rather than the repairman’ (Fordyce 1996).

The overwhelming majority of patients present with non-specific disorders. Most of these need not reduce activity while recovering, rather modify how they are active; e.g. use better posture, mechanics and awareness. A few may require a very short-term reduction in activity but none should become disabled. Natural history is favorable for most, but recurrence and the long-term need attention.

Only a small percent have specific disorders; of these radicular pain ( $\pm$  radiculopathy) is the most common, but involves less than 5% of the patients. HNP is by far the most common cause of radicular pain, but this group also includes stenosis, instability, z-joint cysts and other soft tissue causes of root irritation or compression – most improve with non-operative care (Atlas 2001; Chou 2007). ‘Red Flags’ (e.g. cauda equina compression, cord compression, fracture, metastasis etc.) are encountered even less frequently – but require us to be ever diligent.

In 1984 we conceptualized our 3-stages model for activity-related musculoskeletal disorders (see table below). Stage 1 is not an actual musculoskeletal disorder, simply warning signals that one can develop – the warning signals are due to mechanical and/or physiological fatigue. All cumulative/repetitive strain disorders have to pass through this stage before progressing to a nonspecific (stage 2) or specific (stage 3) disorder; thus all cumulative/repetitive strain disorders are (theoretically) preventable if warning signals are interpreted correctly and facilitate actions and behaviors that address root issues. A traumatic injury starts as a stage 2 or 3 disorder.

| <b>DRS 3-Stages of Activity-related Musculoskeletal Disorders</b>                                                                                                                                                                                                                  |                                                                                                                                                                                   |                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| We developed this model in 1984 to connect treatment and prevention strategies through an ongoing assessment process in attempt to facilitate musculoskeletal self-efficacy and connect to a long-term view or managing musculoskeletal health and physical, functional abilities. |                                                                                                                                                                                   |                                                                                                                                                          |
| <b>Stage 1<br/>(Primary Prevention)</b>                                                                                                                                                                                                                                            | <b>Stage 2<br/>(Secondary Prevention)</b>                                                                                                                                         | <b>Stage 3<br/>(Tertiary Prevention)</b>                                                                                                                 |
| Warning signals only (i.e. intermittent symptoms of mechanical and/or physiologic fatigue)<br>No directly relevant signs<br>No interference with function                                                                                                                          | Signs and symptoms consistent with a nonspecific disorder; rapidly reversible with early intervention.<br>Focus is full recovery and prevention of recurrence and/or consequence. | Unequivocal structural pathology; either not fully reversible or slowly reversible. Focus is to minimize consequences and restore function to potential. |

Stage 1 (primary prevention) is encountered with prevention programs onsite in industry or other such settings; it is rare for someone to seek medical consultation at this stage. However, as stage 2 and most stage 3 disorders resolve (with or without treatment) they retreat back to stage 1 conditions. The patient needs to be educated and trained to understand this and provided with tools to control these warning signals and maintain their physical ability going forward. This is where the 5 core elements need to be integrated into the lifestyle.

When people seek treatment for their back or neck pain problem the prevention focus is initially secondary or tertiary; once the problem is fully resolved and the patient is now managing warning signals it can transition to primary. So, for most clinicians a transition to a prevention-based strategy needs to take place in their treatment setting. Certainly McKenzie championed

this transition starting in the late 1970s when he introduced his concepts of ‘self-treatment’ for low back pain; this has grown into a multinational educational institute with far-reaching influence. I was part of the original group of six therapists that helped him get the institute organized and going that lasted for sixteen years before branching out. So there is strong influence by McKenzie in our system – we all stand on the shoulders of giants before us.

In the treatment setting I create an environment where it is expected from the start that my job is to figure-out their problem and give them tools to self-manage through recovery and into the long-term. I help them along the way in whatever manner is necessary to gain control of their symptoms and signs, restore their normal activity tolerance, help them develop constructive coping and problem-solving skills etc. This often involves manual therapy and therapeutic exercises, but assessment and teaching skills are ultimately most important. The following outlines our basic assessment process:

|                                                                                                                                                                                                                                                 |                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>History:</b> A structured interview that facilitates trust, confidence and gets at root issues – this is a communication and teaching opportunity for both patient and clinician. Beware of leading the patient’s answers to your questions. |                                                                             |
| <b>Screening</b>                                                                                                                                                                                                                                | R/O or identify cautions, contraindications and co-morbidities              |
| <b>4-Key Questions</b>                                                                                                                                                                                                                          | 1) Onset; 2) Symptom Location; 3) Symptom Frequency; 4) Symptom Behavior    |
| <b>Diagnostic Results</b>                                                                                                                                                                                                                       | Tests performed, results, correlation and impact on patient’s perspective   |
| <b>Previous History</b>                                                                                                                                                                                                                         | Is this recurrence, progression and other related MSD problems or injuries. |
| <b>Function/activity Goals</b>                                                                                                                                                                                                                  | Establish measureable goals to guide treatment and determine outcome.       |

|                                                                                                                                                                                                                       |                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Examination:</b> This ultimately identifies whether the disorder is nonspecific or not. We focus our conclusions around those findings that directly affect ‘the’ symptoms and are most relevant to their problem. |                                                                                     |
| <b>Observation/inspection</b>                                                                                                                                                                                         | Note asymmetry, acute deformity, signs of trauma, anomaly or disease and abilities. |
| <b>Posture</b>                                                                                                                                                                                                        | Static and dynamic habits relevant to their individual problem.                     |
| <b>Neurologic</b>                                                                                                                                                                                                     | Presence or absence of motor, sensory or reflex changes relevant to problem.        |
| <b>Motion</b>                                                                                                                                                                                                         | Direct and indirect relevance to symptoms; intra and extra-segmental.               |
| <b>Muscle Testing</b>                                                                                                                                                                                                 | Contraction, stability and/or functional testing.                                   |
| <b>Auxiliary</b>                                                                                                                                                                                                      | PRN – specific to the individual’s disorder.                                        |

At the end of the history and basic exam we have established the patient’s most relevant signs and symptoms, their normal activities that have been most adversely impacted and analysis of how they are coping with and managing their problem. Using the specifics of their problem I am encouraging throughout the process while formulating the most appropriate strategy for them to gain control.

The next step is to assess the patient’s response to selected treatment procedures. This occurs in a sequence where symptom response is assessed first, then sign response, followed by determination of any change in function (i.e. one or more of elements of the functional goals). We call the procedures that we find effective in controlling the symptoms, signs or function “tools to fight back®” or TTFB® for short. How quickly and completely we can gain control over the patient’s problem dictates the treatment strategy employed – this is covered in more detail a

little later in the workshop. Throughout the process the patient is educated about how to constructively address their particular problem.

The assessment doesn't stop at the end of the initial visit, it is an ongoing process eventually taken over by the patient after discharge – they need to be trained to do this effectively. The basic elements of the reassessment include identification of any changes in patient self-rating of symptoms and function, measurement of change in relevant signs and function, assessment of patient self-management, problem-solving flare-ups or plateaus in recovery, accuracy of conclusions and appropriateness of treatment plans. This is the 'trenches' of clinical practice, where the accuracy and effectiveness of our clinical conclusions are confirmed, modified or rejected and where the patient learns how to manage their particular problem – we need to remain acutely aware of the potential long-term impact this experience might have on their activity, health and abilities.

### **Tool # 2 - Patient Education and Training**

This includes the diagnosis or explanation of cause given to the patient, predictions and instructions. This interface with the patient is powerful, sets the tone for the course of treatment and can have a significant long-term impact on the patient's perceptions, function and activities.

**Diagnosis and explanation of cause** - the first issue concerns the diagnosis, the clinician's choice of language, tact and subsequent predictions given to the patient. It has been known for many years that negative language related to disc and degenerative spine diagnoses is associated with an increased risk for chronic pain and disability – referred to as a socio-psychological stigmata or the 'labeling effect' (Abenheim 1995). Clinical guidelines for the past 25 years have stressed the importance of positive reinforcement and remaining active (Spitzer 1987; ACC 1997; Koes 2001, Waddell 2001; Chou 2007; Delitto 2012). Telling a patient they have a bad disc problem or severely degenerated spine, followed by a series of 'don't do this and don't do that' certainly doesn't encourage one to feel optimistic about overcoming their problem nor want to become active. Bottom-line is; be appropriately positive, recognize those who are negatively impacted by the diagnosis and find ways to redirect their attention and actions, construct a treatment program that assists them in doing this, and be encouraging even if you are referring them for further evaluation or other forms of intervention.

**Predictions and expectations** - the second issue is the influence of predictions/expectations, by both the clinician and the patient – this was identified in a recent PT paper as an overlooked, but important factor in treatment of musculoskeletal pain (Bialosky 2010). I agree strongly with this and assess expectations routinely. In psychotherapy Hubble (1999) found placebo, hope and expectancy to account for 15% of outcome variance – I suspect there is a similar effect with physical therapy for ARSD.

As a general guideline, my expectation is for full recovery for all patients with nonspecific disorders (stage 2). The question is whether that will be achieved quickly or eventually; this is dependent mostly upon duration of the episode and level of interference with activity when

physical therapy has been initiated (refer to Spine Center Study). Patients that are seen shortly after onset with a nonspecific ARSD and have remained active in spite of their problem are almost always rapidly resolvable – in our system the postural-ergonomic or reduction strategy is employed. The chronic nonspecific disorders that have remained fully active might be rapidly reversible too; but long-standing problems with significant interference with activity and function are invariably gradual responders – in our system the remodeling, stabilization or function strategies are employed.

In the case of specific (stage 3) disorders there is a greater possibility of some degree of irreversibility and long-term impact on activity-tolerance and function (e.g. spinal stenosis, unequivocal spinal instability, failed surgery etc.). But, there is always potential for improvement in activity tolerance and function. The combination of a specific disorder with severe impact on activity and maladaptive behaviors is particularly difficult and requires all the players to be on the same page working towards guiding the patient to restore function.

In the case of acute radicular pain, most frequently due to a HNP we start with an anti-inflammatory strategy that transitions into a stabilization strategy as soon as the symptoms and signs are under reasonable control – we keep the patient as active as possible throughout the process and work closely with the medical physician regarding medications and/or the need for steroid injections. In the chronic phase these disorders often present as a nerve root entrapment or adherence syndrome (Rath 1997) - our remodeling strategy is usually very effective once we have sorted-out the condition.

All of this raises the question; ‘what is full or 100% recovery ’? Our general definition is the elimination of all directly relevant signs and symptoms with a complete return to all of the patient’s normal activities specific to their lifestyle – there are many evidence-based methods of measuring this. If we had pre-onset physical ability data for the individual we objectively measure their degree of recovery in terms of ROM, strength, endurance etc. In the absence of having specific data for the individual we could compare their physical abilities to normative data and/or the ability to meet the physical demands of their lifestyle safely and acceptably. We often use a combination of these measures, at least conceptually in our education and training of the patient for both recovery and long-term maintenance.

**Problem-solving** – many clinicians are not comfortable when a patient reports that their symptoms have worsened during treatment. The first priority is to determine whether or not there has been a significant deterioration in their condition (e.g. new neurologic signs etc.); if so they need to be referred to the medical physician. However, in most cases there is a good explanation for the increase in symptoms and you need a system to figure it out. Many times the source of the flare-up was things like; they slept in the wrong position, sat for too long in the wrong posture, misinterpreted new soreness for ‘the’ pain, etc. These situations are opportunities to guide the patient through a process of learning how to control their problem and build their self-efficacy. However, if you panic they will panic and the result can be a negative lesson learned.

**Sequencing of instructions** – it is important be clear in the purpose of any instructions you give to the patient. We developed the term and concept, “tools to fight back®” early in the formation of our system so the patient or client would understand these are actions they should take to confront their symptoms or signs. This is the entire focus in the initial management of rapidly resolvable problems. We found it important to train the individual to apply these tools in a sequence in order to facilitate change in their biomechanical habits and build their self-efficacy. They are instructed to respond as quickly as possible to warning signals until control is established in the sequence listed below – there is no need to progress farther in the sequence once control is established. This provides them with a method to determine how effective a particular tool is, how well they are currently tolerating the position or activity that generated the warnings, and a reason to use these tools proactively. The sequence is as follows:

- 1<sup>st</sup> – correct your postural alignment
- 2<sup>nd</sup> – correct your body mechanics and/or ergonomics
- 3<sup>rd</sup> – take a micro-pause
- 4<sup>th</sup> – apply the opposite movement rule©
- 5<sup>th</sup> – apply the specific TTFB® identified to control symptoms, signs or function.

Disorders that are not rapidly resolvable need these instructions and training too, but this does not result in full control of their signs or function. This is where you need to separate out the guidelines and reasoning for application of these ‘other’ tools used to cumulatively restore full function. These

**Special case of nonmechanical disorders** – these patients are typically chronic and nonspecific problems with symptoms that do not behave mechanically, the signs are inconsistent or absent, but their problem significantly interferes with their ability to be active. Adverse psychosocial factors and maladaptive behaviors predominate in this group. This is a significant and growing population and includes those with chronic widespread pain; the point prevalence for this is reported to be as high as 11.2% (Croft 1993; Arnold 2011). These patients can be helped with the correct treatment strategy; there is good evidence for the efficacy of exercise (Busch 2007). It is critical not to blame the patient for their failure to respond to your typical treatment approach (Haldeman 2008). Too often these patients are ‘blown-off’ by clinicians as ‘head-cases’, malingering etc. – the influence on the patient is certainly not empowering. I encourage therapists with this attitude to be introspective if they are interested in becoming a more complete clinician, or keep their opinions to themselves and refer on to a colleague more skilled at managing this group of patients.

We utilize a functional treatment strategy with non-mechanical that is essentially a graded exercise or exposure approach with a strong emphasis on training for biomechanical control, activity goal specific, strong encouragement and support while downplaying any focus to symptoms. We recognize 2 general groups of activity-related nonmechanical disorders; those with legal involvement and those without. The second group is typically much easier to manage and achieve a successful outcome.

**Patient compliance** – there are two aspects to problems with patient compliance; one is the obvious failure to follow through with instructions or guidelines, but the other is continuing to follow advice and instructions in spite of a failure to be of benefit. Patients who do not have self-efficacy in these regards or a strong internal locus of control are most prone to ‘over compliance’. For example, I have encountered patients 20-30 years later still afraid to lie on their stomach, bend over or those who couldn’t possibly conceive of benefits to running because of the deleterious effect the ‘pounding’ would have on their back and joints etc. Did those clinicians consider the possible long-term impact of their instructions? We need a more nuanced

### **Tool # 3 – Application of Manual Therapy**

Mobilization, manipulation and massage are central tools in physical therapy treatment of MSDs. However, the philosophy that guides the application of these tools determines whether or not they play a positive or negative role in prevention. We propose that the rapid improvements achieved with manual procedures need to be coupled with patient-based actions – this is most easily accomplished when the choice and application of the techniques include the patient in decision-making and performance.

In order for manual techniques to be both safe and effective they require specific indication, need to follow logical guidelines for progression of force and ultimately connect to specific activity goals. McKenzie’s perspective on manual therapy and the progression of force is classic and makes the patient–therapist connection (McKenzie 1989). I feel that Mulligan’s contribution of combining mobilization techniques with patient movement is the most significant advancement in manual technique during my career (Mulligan 1993; 1999). Our approach is heavily influenced by these two giants, plus Cyriax and Mennell – they inspired many of the techniques we have developed and utilized over the years.

There are many ways that manual techniques can be connected to prevention-based strategies. The common factors are how the mechanics and benefits of the technique are explained, training the patient to replicate the same or similar effects with self-management techniques, connecting the intention of the technique to achieving functional goals and incorporating all this into the long-term strategy. The following are some examples:

- Connect improvements to specific postures and body mechanics to sustain benefits from the procedure – train the patient how to do this and assess their response.
- Connect the generic mechanics of the procedure to specific self-treatment procedures so the patient can learn to replicate the results; press-ups for extension-responsive low back disorders is classic.
- Apply the technique during the movement or activity that is troubling the patient; Mulligan’s techniques and modifications are classic.

- Educate the patient to recognize the warning signals that preceded the need for the manual technique – train to sequence TTFB®.
- Connect to how strategic strength and conditioning can protect the improvements and reduce vulnerability to recurrence or progression.

We divide manual techniques into 3 general groups: 1) joint mobilization techniques, 2) soft-tissue mobilization techniques and 3) combined performance (patient and therapist) techniques (joint and soft-tissue). All are connected to the core prevention elements and specifically converted into self-management procedures; obviously the easiest segue for this is with the combined performance techniques.

The application of manual therapy techniques can have a negative impact in regards to prevention when the treatment plan is too passive, the patient becomes reliant on the clinician, and/or the procedures are not directly specifically to control of the relevant signs, symptoms and restoration of function. In these situations the application of manual techniques becomes too repetitious and symptom focused; a reputation some manual therapists have developed that causes some to question the benefit and purpose of these procedures.

#### **Tool # 4 - Therapeutic Exercise**

Therapeutic exercise has been the foundation of Physical Therapy since inception; our primary tool to eliminate signs, control symptoms and regain function. These are tools that can address biomechanical technique, range of motion, strength and endurance demands, essential to both full recovery and prevention; i.e. one of our core prevention elements. These tools become prevention-based when designed to be continued autonomously – this requires guidelines, problem-solving, psychomotor skills and motivation.

There are many variations of exercise for back and neck pain disorders; however the general consensus is that exercise is important for both treatment and prevention but no one method is clearly superior to others (Linton 2001; Hayden 2005; Rackwitz 2006; van Middelkoop 2010). Therapeutic exercise needs to be customized to the patient's clinical problem and ultimately to meet the physical demands of their lifestyle safely and acceptably. To be preventative the exercises need to be designed in a way that encourages the patient to make a long-term commitment; i.e. integrate into their lifestyle. The many health benefits of exercise should be incorporated into the explanation and plan and can help with motivation; this includes prevention of chronic disease (Booth 2000; 2002), improved brain function (Erickson 2011; Hopkins 2012), and mortality (Myers 2002; Byberg 2009; Sun 2010).

Based on our experience with the prevention continuum in industry and outpatient treatment, we developed an approach to therapeutic exercise (i.e. strategic strength and conditioning) that connected to all the core prevention elements. Rather than focus on specific methods or techniques of exercise we chose to focus on fundamental elements, as follows:

1. Therapeutic exercise starts with postural (biomechanical control) strengthening. This reinforces core element # 1 and sets the foundation for proper exercise technique.
2. The initiation and progression of isolated strengthening exercises should be consistent in principle with the patient's directional preference and risk factors.
3. Stabilization exercises should be designed for the patient to learn how to maintain biomechanical control when active and exerting themselves; specific to their lifestyle demands. The connection is to the importance of biomechanical control under load, along with the importance of loading for strength and tolerance of the connective tissues.
4. Targets should be to restore and maintain a greater physical ability than the physical demands of the individual's lifestyle safely and acceptably.
5. Programs should be customized to the individual and designed to encourage a lifelong commitment. This requires flexibility in your approach and always putting the patient's needs first, before your preferences.

### **Guidelines for Safe & Effective Strength and Conditioning**

Our guidelines were developed to provide patients with confidence that the exercise design is both safe, effective, emphasize the importance of technique and monitoring their response, based on the importance of physical adaptation to the biomechanical and physiological demands with an emphasis that the benefits are always going forward.

The starting exercise dose is low with a focus to proper technique and establishing good tolerance; then logically and progressively increasing the dose towards physical demand targets. These are achieved relatively quickly for some, and might take months and years for others (e.g. safe and effective preparation for a marathon). Once targets are achieved, the individual is instructed to use exercise as a maintenance tool. This could be the same exercises used to achieve targets or others that are similar in challenge and demand levels. The guidelines are the common factor, as is the importance of established objective targets. The following are the guidelines:

1. Perfect technique from start to finish; when technique begins to deteriorate the individual is fatiguing whether they realize it or not – stop, recover before proceeding.
2. No reproduction of 'the' pain; modify the technique or stop and seek advice.\*
3. At first when the sensations of fatigue begin to build, stop and recover before proceeding - eventually stop only if technique deteriorates.
4. Assess the degree of tissue soreness the next day: if no soreness they are adapted to that dose of exercise; if severely (unacceptably) sore take extra time to recover and then restart

at a lower dose; if acceptably sore keep the same dose and don't increase until soreness disappears. Soreness does not mean harm or damage; it means not adapted and the need to build tolerance to physical demand.

5. Don't progress the level of exercise until able to perform a target (e.g. sets and reps) and meet all the criteria above repeatedly for at least a week.

\* There are times when we intentionally want to reproduce pain with these exercises to remodel a lesion in the muscle, tendon and/or bursae. In this case the pain that is reproduced must not get progressively worse, persist afterwards or have any adverse consequences – we use the Duffy-Rath Traffic Light analogy to communicate this; i.e. yellow lights are okay, red lights are not.

## **The Prevention Continuum**

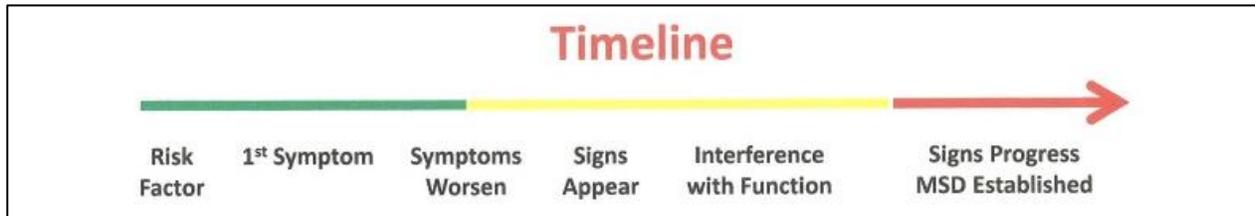
The opportunities for prevention occur before, shortly or well after an actual musculoskeletal disorder develops and becomes chronically established. Notice I did not say 'before pain develops' – pain can be a normal experience of fatigue and occasional aches and strains are expected with active people. We developed our three stage model to educate and train the individual to recognize and control warning signals before an actual MSD develops (primary prevention), or to take actions that facilitate their recovery to the point where they are managing warning signals for the prevention of recurrence (secondary or tertiary prevention). There is a focus to the dynamic nature of these disorders and the continuous need for self-service and maintenance of their biomechanical health and function.

**Stage 1** – warning signals of fatigue, but no relevant signs or interference in function (yet).

**Stage 2** – the nonspecific disorder stage; a progression of stage 1 when the onset mechanism is cumulative with a progression of symptoms, the emergence of signs and interference with function but no hard signs of structural pathology (e.g. HNP, radicular pain etc.). This includes a wide spectrum of disorders with many sub-groups. These are rapidly reversible with early intervention shortly after the progression from stage 1. A slow response with the potential for fully reversibility is more likely when the intervention starts in the late chronic state and the signs and symptoms are closer to a stage 3 MSD.

**Stage 3** – in this stage the signs and symptoms unequivocally correlate to specific structural pathology and there is a relevant, often significant interference with physical function. Intervention was either late or ineffective at controlling the relevant signs, symptoms and/or interference with activity. This is the group where conservative care might not be as effective as desired and help from the medical physician or surgeon warranted. Consequently full reversibility may not be possible, so the focus is to minimizing consequences with a focus to enhancing whatever control is possible – this is tertiary prevention. It is critical to remain positive,

encouraging, focused to physical function and ability, and the potential to improve with controlled daily investments. Having a strategy to constructively deal with flare-ups is an important factor for long-term success.



The focus of our strategies is to prevent the cumulative consequences that can result from experiencing back pain through understanding and controlling the symptoms, getting to root cause issues and appropriately changing habits and behaviors that mitigate risks going forward. This is consistent with the summary of the European guidelines for prevention of low back pain (Burton 2006); their conclusions were that physical activity/exercise and appropriate biopsychosocial education were the most promising tools for prevention.

### Primary Prevention

There is limited evidence of success for primary prevention of back and neck pain. However, we experience daily reports from our clients across many industries how they have applied the DRS information and tools effectively – long term. Possibly the anecdotal evidence is ahead of the hard science, the research questions have not been effectively developed and/or there are so many relevant factors to control that the answers are too individual? The expression attributed to Locke; “the absence of proof is not the proof of absence” applies. However, to be in a position to affect primary prevention for ARSDs you need to be providing onsite occupational services and/or have direct access to the general public.

The European guidelines for the prevention of LBP put the issue into a proper perspective; “The general nature and course of commonly experienced LBP means that there is limited scope for preventing its incidence (first-time onset). Prevention, in the context of this guideline, is focused primarily on reduction of the impact and consequences of LBP.” (Burton 2006). Focused to attempting to prevent the experience of pain without attention to impaction of function and ability is an exercise in futility. Understand the symptoms, use them to educate and train for needed change in key habits and behaviors.

In a literature review Linton and van Tulder (2001) concluded that exercise was the only tool with any evidence for preventing neck and back pain; but it was not clear that any method is better than another; they indicated better designed investigations are required. This conclusion was supported in the European guidelines previously mentioned; they also stressed the importance of getting all the stakeholders on the same side – a huge issue in the tertiary prevention group.

The primary prevention issue is also complicated by the study populations and the difficulty factoring the weight of effects at home, play verses work on the risk for ARSDs. Reporting mechanisms in industry are date of ‘injury’ driven; this affects how the employee is interviewed by the healthcare provider (i.e. often leading the questions to obtain a reason and date to put on the form) and assumptions taken once an injury date has been officially reported (i.e. the work performed is the cause). Our experience, as previously mentioned, is that often there is no one mechanism of onset so many of the problems the employee is having at work is a consequence of the cumulative effect of their lifestyle combined with an absence of effective actions and behaviors to control root issues – it is complicated. The table below illustrates our model for the role of the prevention continuum for work-related MSDs.

| <b>Duffy-Rath System® - MSD Injury Report to Disability Progression</b><br>(All Steps of Action Require a Long-term Focus to Prevent Disability & Preserve Function and Activity)                                                 |                                                                                                                                                  |                                                                                                                                                                                   |                                                                                                                                                                                                                                      |                      |                                                                                                                                                                                                                           |                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Status Prior to Reporting</b><br>(Vulnerability for MSD is dependent on history, biomechanical, exercise habits and multiple other bio-psycho-social factors)                                                                  | <b>Report to Medical</b>                                                                                                                         | <b>OSHA Recordable Action</b>                                                                                                                                                     | <b>Work Restrictions</b>                                                                                                                                                                                                             | <b>Days Off Work</b> | <b>Permanent Partial Disability</b>                                                                                                                                                                                       | <b>Permanent Total Disability</b> |
| Address 5 core elements for prevention, health & function, facilitate a positive culture, provide a range of proactive prevention and ergonomic services to address the most relevant workplace and worker intrinsic risk factors | First aide actions<br>Need to include biomechanical training and education.<br>Identify need for ergonomic assessment; perform ASAP when needed. | Treatment must be active, directly address and immediately control most relevant signs and symptoms with self-treatment actions.<br>Implement ergonomic controls when applicable. | Identify and develop plan to control most relevant factors leading to restrictions and/or loss; objectify factors and restoration of ability; develop plan to prevent recurrence and/or progression. Get back to full activity ASAP. |                      | Minimize impact of the many negative factors associated with MS disability (including reduced life expectancy); get back to full, potential activity ASAP; address the most relevant lifestyle factors to the individual. |                                   |
| <b>Primary Prevention</b>                                                                                                                                                                                                         |                                                                                                                                                  | <b>Secondary Prevention</b>                                                                                                                                                       |                                                                                                                                                                                                                                      |                      | <b>Tertiary Prevention</b>                                                                                                                                                                                                |                                   |

The following are some interesting studies that demonstrate evidence for use in developing prevention strategies and tactics:

|                            |                                                                                                                                                                                                                  |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gundewall et. al. 1993     | Exercise during work to build back strength, endurance and coordination with physiotherapist for nurses resulted in a significant reduction of back pain and lost days from work; ROI > 10.                      |
| Snook et. al. 1998         | Controlling flexion in early morning demonstrated to be a form of self-care with potential to reduce pain and costs associated with chronic nonspecific LBP.                                                     |
| Nassau 1999                | Prework functional screening (i.e. JME), posture and body mechanic training and multidisciplinary approach significantly reduced injuries and costs for nursing department – describes evolution of the program. |
| Mendez & Gómez-Conesa 2001 | Identify the importance of practice and motivating strategies (i.e. interactive education and training) for the prevention of LBP.                                                                               |
| Larsen et. al. 2002        | Passive prone press-ups were effective at reducing back problems in military conscripts.                                                                                                                         |
| Peate et. al. 2007         | Flexibility, body mechanics and core strengthening (functional movement screen) reduced injuries and lost time in fire-fighters.                                                                                 |
| Bergström et. al. 2007     | Increasing positive challenges and reducing repetitiveness was effective for primary prevention of back or neck pain in blue collar workers.                                                                     |
| Guzman et. al. 2007        | Demonstrates how personal experience and opinions of stakeholders influence the setting of priorities of injury prevention and subsequently                                                                      |

|                       |                                                                                                            |
|-----------------------|------------------------------------------------------------------------------------------------------------|
|                       | can affect outcome.                                                                                        |
| Schmidt et. al. 2010  | Investigation under way to determine if risk tailored prevention strategies can prevent disabling LBP.     |
| Koh and Sebelius 2010 | Identify the need to move to prevention strategies and outlines this intention in the affordable care act. |
| Kovas et. al. 2011    | Limited, short-term advantage using a comic book to prevention and manage LBP in schoolchildren.           |

Jean and I got our start in industry in 1984 when the medical director of a major corporation contacted us to help with a growing carpal tunnel problem with his employees. Upon evaluation we found that the workers not responding to treatment actually had neck problems; either the entire cause or an overlooked component of the problem. We resolved all the cases without surgery or injections; we noticed that all of these cases had many opportunities for prevention had they known to look for and control the warning signals. We brought this to everyone’s attention and eventually were given the opportunity to redesign a ‘stretch break’ program that had previously proven to be ineffective. This is when we developed and implemented the 3-stages concept and the TTFB® system for primary prevention. They challenged us to implement this new program in a department with the highest incidence and severity of MSDs; the new program was extremely successful and eventually led to a site-wide and corporate-wide adoption of the new model. Our prevention services have progressively expanded by ‘word-of-mouth’ ever since.

Over the years we have developed a multitude of programs, implemented across a full range of occupations and environments. Regarding primary prevention, our most successful programs are those where we are fully imbedded in an existing injury prevention culture providing ongoing group and individual counseling, advice and coaching for existing, new and transferred employees. These primary prevention services include ergonomic assessment with recommendations for administrative and engineering controls, functional demand evaluation (FDE) with focused training to mitigate risks for injury, development of job matching evaluations (JME) to eliminate risks related physical demand mismatches, group stretching and exercise programs and many other interactive educational programs. However, our most effective service has been the implementation of daily/weekly individualized counseling (coaching) to implement Tools To Fight Back® that build musculoskeletal self-efficacy. This involves most of the previously mentioned services, requires orientation by all the stakeholders to get started, and is then continuous and ongoing – this allows for differing rates of readiness to hear and apply the message (see table below).

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |               |                    |               |               |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------|--------------------|---------------|---------------|---------------|
| <b>Primary prevention onsite in a heavy manufacturing facility with DRS Prevention Patrols (N-1,012)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |               |                    |               |               |               |
| Workers and supervisors go through orientation training for the 5 core prevention principles and tools; then DRS prevention specialists visit the work areas weekly and provide individual advice and counseling upon request from the employees – always a very popular ‘in demand’ service. When completed the advice and counseling case is assigned an outcome based upon a three point assessment: 50 pts. = worker perceived value; 25 pts. = understands advice & counseling; 25 pts. = implementation of protective work habits, micro-pauses and opposite movements (TTFB®). Excellent is ≥ 90 points; Good is ≥ 70 < 90 points; Fair is ≥ 25 < 70 points; Poor is < 25 points. |                   |               |                    |               |               |               |
| <b>% Low Back</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>% Mid-back</b> | <b>% Neck</b> | <b>% Excellent</b> | <b>% Good</b> | <b>% Fair</b> | <b>% Poor</b> |
| 27.4%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6.2%              | 20.8%         | 48.3%              | 41.0%         | 8.6%          | 2.1%          |

For the total prevention continuum these primary services need to be supported by complimentary treatment focused to secondary, tertiary and quaternary prevention. Too often we have found that treatment and prevention language, premises, philosophy and models are in conflict; our services attempts to correct this.

## Secondary Prevention

Clinical practice is where most physical therapists have opportunities for prevention strategies; i.e. secondary or tertiary. The traditional physician-referral model has often placed physical therapy towards the end of the line of interventions; i.e. when rest, medications and time failed to resolve the issue. However there have always been practices where physicians considered physical therapy the first choice for treatment of ARSD; this has been our experience and one reason we have sought to work closely with many family physicians since 1984. Early patient referral is essential for secondary prevention and family medicine is the most frequent point of entry into the healthcare system. However, treatment of ARSD is only secondary prevention when it is constructed as such.

By definition, secondary prevention primarily applies to nonspecific ARSDs. The DRS approach emphasizes educating and training the patient to self-manage; to do this with a wide spectrum of patients we have developed six basic treatment strategies depending upon the severity/impact of the signs and symptoms, degree of interference with function, how quickly full control can be achieved and any other risk/clinical factors relevant to the patient’s activity-related problem. The following outlines our six strategies:

| <b>DRS Treatment Strategy</b>                                                                                      | <b>Clinical Characteristics</b>                                                                   | <b>Course of Recovery</b> |
|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------|
| Posture-ergonomic                                                                                                  | Warning signals only                                                                              | Rapid                     |
| Reduction                                                                                                          | Intra-segmental derangement.                                                                      | Rapid                     |
| Remodeling                                                                                                         | Chronic loss of normal motion, contraction and/or activity tolerance.                             | Cumulative                |
| Stabilization                                                                                                      | Clinical evidence of instability with weight bearing functional demands and/or end range loading. | Cumulative                |
| Anti-inflammatory                                                                                                  | S/P trauma, acute and/or irritable.                                                               | Rapid or Cumulative       |
| Function                                                                                                           | Non-mechanical activity-related.                                                                  | Cumulative                |
| Strategies can be transitional depending upon patient response (anti-inflammatory strategy is always transitional) |                                                                                                   |                           |

Our experience is that early intervention leads to the most effective and efficient outcomes; the posture-ergonomic and reduction strategies are the most frequently utilized with acute and subacute patients. When physical therapy starts after the condition has become chronic efficiency is affected more than effectiveness; remodeling, stabilization or function strategies enter the picture and all of these result in a slower (cumulative) response and return to function. Our data has consistently demonstrated that if you get the patient before radicular signs and symptoms develop, and don’t allow the patient to become idle (e.g. go out of work) prior to starting physical therapy we are most successful. This is our ‘internal evidence’ and it is consistent with scientific (‘external’) evidence. This was presented previously in the tables for the Spine Center Study; reorganized to illustrate these points in the table below:

**Spine Center Study:** Early intervention most likely to have local symptoms only and clearly had the most effective and efficient outcomes in this consecutive case series. These results have been repeated many times in our clinics.

|                                  | Excellent | Good | Fair | Poor | Mean Visits | Mean Weeks |
|----------------------------------|-----------|------|------|------|-------------|------------|
| QTF 1 (Local pain only)          | 74.4      | 20.7 | 4.1  | 0.8  | 4.6         | 3.3        |
| QTF 2 (Local + Prox. Limb Pain)  | 59.0      | 36.1 | 3.3  | 1.6  | 5.0         | 5.5        |
| QTF 3 (Local + Distal Limb Pain) | 46.4      | 38.1 | 10.7 | 4.8  | 7.1         | 7.2        |
| QTF 4 (Radiculopathy)            | 16.9      | 30.2 | 20.8 | 32.1 | 7.1         | 4.8        |
| Acute (< 7 days)                 | 73.3      | 20.0 | 0    | 6.7  | 4.7         | 2.4        |
| Subacute (1-7 wks)               | 66.3      | 22.1 | 4.7  | 6.9  | 5.0         | 3.2        |
| Chronic (> 7 wks)                | 46.8      | 34.5 | 11.3 | 7.4  | 7.1         | 6.1        |
| Active at IE                     | 59.2      | 29.6 | 5.8  | 5.4  | 5.2         | 4.4        |
| Idle at IE                       | 41.0      | 29.5 | 16.7 | 12.8 | 9.8         | 6.8        |

In addition to working with family physicians, when we provide treatment onsite in industry early intervention with physical therapy is the purpose; this has repeatedly been a great experience for our secondary prevention model. Our initial results in turning around a caseload of chronic MSDs headed (potentially) for surgery with a self-management, prevention of recurrence based model is how we got into the prevention business in the first place.

Our first 2 onsite treatment contracts were in a light manufacturing (surgical and pharmaceutical) environment; the risk factors to control involved static postures (sitting or standing), work-zones and highly repetitive tasks. The concern was not a physical demand mismatch; core elements 1-3 and 5 were the issue. Almost every worker that came for treatment had a nonspecific disorder, a non-traumatic (cumulative) onset with symptoms that had recently developed; outcomes were >90% good to excellent and rarely had a poor outcome (<1-2%). The average number of treatment sessions was <6 at one site and <4 at the other. These two companies had labor represented workers, but the relationship was complementary, the working conditions were excellent and most people enjoyed working there. The medical director recognized our services as a major reason the company was able to save more than \$5Million dollars in our first 2 years; most of this was projected savings related to a reduction in time loss, indemnity costs and healthcare costs related to surgery.

Our 3<sup>rd</sup> onsite treatment was in a heavy manufacturing environment with an adversarial relationship between management and labor. Physical demand mismatch, risks associated with an abundance of overtime, along with mistrust and dissatisfaction became significant issues. In addition there were 3 shifts to cover. Needless to say the challenges were greater and we needed to expand our model and services; this is when we put more emphasis on the use of FCEs, FDEs, JMEs and wider range of ergonomic and risk assessment tools. This site remains the home base for our nation-wide operation, however the environment has changed as manufacturing was phased out and the facility is now a center of excellence for engineering. We gained many valuable experiences throughout this transition; learning more by the day.

Below we provide a summary of outcomes with this 3<sup>rd</sup> onsite treatment service and insights into the problem with recidivism and recurrence of some MSD cases. The most prevalent MSDs were

ARSD (44.3%) with low back pain disorders comprising two-thirds. Our approach, as always stressed the importance of guiding patients through recovery while continuing to work; an excellent relationship with the medical department and the labor union enabled us to employ that strategy successfully.

| Data for secondary prevention with onsite treatment in a heavy manufacturing company over a 7 year time period. There is a higher rate of poor outcomes and the average number of visits was 9.2 and weeks was 7.2; considerably higher than the first 2 onsite treatment programs in light manufacturing with an ideal work environment. |              |           |       |       |      |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|-------|-------|------|-----------|
| New                                                                                                                                                                                                                                                                                                                                       | Total Visits | Excellent | Good  | Fair  | Poor | Repeaters |
| 2,279                                                                                                                                                                                                                                                                                                                                     | 22,559       | 29.4%     | 45.8% | 17.4% | 7.5% | 15.5%     |

To address the recurrence, co-morbidity and chronic musculoskeletal pain issue we developed a number of programs to supervise and guide the employee back to targeted physical abilities through exercise and activity. It became apparent that there is a group of workers that need ongoing support and supervision to stay active and continue working, especially when they start to face problems; unfortunately not everyone develop sufficient musculoskeletal self-efficacy. This is when we branched into managing the health and wellness side of prevention to compliment and coordinate (dovetail) with our philosophy.

Over the course of the seven years that manufacturing was onsite we were able to demonstrate considerable (direct) cost savings; \$3 dollars saved for every \$1 invested (see table below). Most companies want their employees to be happy, safe and healthy; however when providing services that are intended to do this the bottom-line is their ultimate measure. This is their fiscal prevention target; i.e. control costs. Projected, indirect cost savings was many times greater.

| Cost/savings Heavy manufacturing over 7 year time period providing onsite physical therapy |                |                                               |
|--------------------------------------------------------------------------------------------|----------------|-----------------------------------------------|
| Cost                                                                                       | Direct Savings | Ratio of Cost to Saving (ROI)                 |
| \$936,599                                                                                  | \$2,712,810    | For every \$1 spent there was a \$2.9 savings |

**Requirements for Linking Treatment to a Secondary Prevention Strategy:**

- The treatment needs to actively involve the patient in all key components of care.
- The treatment needs to be focused to restoring the patient’s normal activity levels.
- The patient needs to experience control over their most relevant symptoms, signs and any resulting interference with activity.
- Time to educate and train the patient effectively to self-manage.
- The treatment needs to be positive, constructive and supportive.
- The therapist must remain open and flexible in their approach to effectively customize care to the individual’s need.
- The treatment must include long-term planning; follow-up and availability to assist with problem-solving is encouraged.

It is exciting to see evidence emerge that early referral to physical therapy is not only associated with better outcomes at the end of treatment but with a reduction in the need for future healthcare (Fritz 2008; 2012). That is what we should expect in crafting our treatment plans and what is required for the PT profession to take a leading role. But this will only happen when an active and evidence-based physical therapy approach is utilized and customized to the individual patient (Moffett 2006; Fritz 2007). Early intervention with biopsychosocial education, manual therapy and exercise is associated with better outcomes and psychosocial benefits that are not realized with later intervention (Wand 2012) – maybe psychosocial signs are similar to physical ones, you want to address them before they progress or become entrenched.

### Tertiary Prevention

Physical therapy has played a major role in the treatment and rehabilitation of chronic back and neck problems; too often this is when PT is initiated. There are many issues that concern both tertiary and quaternary prevention. First, it is critical to distinguish the specific and non-specific groups of chronic problems; this is complicated by an over reliance on diagnostic imaging that has a significant problem with a high incidence of false positive findings (see table below). Positive findings with any of these diagnostic tests have to be correlated to the patient’s signs, symptoms and current history. When findings correlate, evidence-based conservative treatment has failed and surgery is considered the patient should be screened for adverse psychosocial factors and physical readiness for the procedure. Included is preparation for post-operative rehabilitation and long-term management (once again) as the benefits of most surgeries are short-lived.

| <b>Diagnostic Accuracy of MRI for ARSD:</b> there is a significant problem with specificity. A diagnostic test that has good sensitivity but poor specificity is better for RULING-OUT when negative than RULING-IN when positive. |                   |                                                       |                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------|-------------------|
| <b>Lumbar MRI</b> (upward limits provided)                                                                                                                                                                                         |                   | <b>Cervical/Thoracic MRI</b> (upward limits provided) |                   |
| <i>Study</i>                                                                                                                                                                                                                       | <i>% Positive</i> | <i>Study</i>                                          | <i>% Positive</i> |
| Jensen et. al. NEJM 1994                                                                                                                                                                                                           | 52%               | Boden et. al. JBJS 1990                               | 28%               |
| Boden et. al. JBJS 1990                                                                                                                                                                                                            | 57%               | Lehto et. al. Neuroradiology 1994                     | 62%               |
| Weishaupt et. al. Radiology 1998                                                                                                                                                                                                   | 67%               | Matsumoto et. al. Spine 1998 < 30 yrs                 | 12-17%            |
| Powell et. al. Lancet 1986                                                                                                                                                                                                         | 33%               | Matsumoto et. al. Spine 1998 > 60 yrs                 | 86-89%            |
| Boos et. al. Spine 2000                                                                                                                                                                                                            | 76%               | Matsumoto et. al. Spine 2010 (TS & CS)                | 46-90%            |
| Alyas et. al. Br J Sp Med 2007                                                                                                                                                                                                     | 85%               | Wood et. al. JBJS 1995 (TS)                           | 73%               |

However, we have found that frequently the patient’s problem has become chronic because root factors related to onset or perpetuation of the disorder have never been directly or adequately addressed. Go back and look at the Spine Center Study data presented and you see that chronicity did not have a negative influence on outcome, the main differences when compared to acute is a higher number of good verses excellent outcome and more visits and weeks required. I would actually group these patients into the secondary prevention group with the expectation that full reversibility will take more time and effort.

Another important issue relates to the patient’s activity level at the beginning of treatment. Many of the obstacles to effective chronic spine pain treatment and tertiary prevention can be eliminated by keeping the patient active throughout the treatment process. The most appropriate strategies to do this are varied and need individualization, but the benefits of activity need to be supported with tools of control that empower the patient; the distinctions between ‘hurt and harm’, ‘pain and damage’ are very important when nonmechanical factors are the obstacles to activity and exercise. The main treatment strategies we utilize with tertiary prevention are remodeling, stabilization and function (see table below).

| <b>DRS Treatment Strategy</b> | <b>Clinical Characteristics</b>                                                                    | <b>Course of Recovery</b> |
|-------------------------------|----------------------------------------------------------------------------------------------------|---------------------------|
| Remodeling                    | Chronic loss of normal motion and/or contraction with a loss of activity tolerance.                | Cumulative                |
| Stabilization                 | Clinical evidence of instability with weight bearing functional demands and/or end range loading.  | Cumulative                |
| Function                      | Non-mechanical with interference with activity tolerance: legally and not legally involved groups. | Cumulative                |

So challenge is to first sort-out who really needs tertiary prevention; when indicated the treatment plan should focus towards prevention of disability. Turner et. al. (2008) identified the following baseline predictors of work disability with back injuries: severe functional disability ratings (Roland Morris Disability Questionnaire; RDQ), the number of pain sites, description of job as ‘hectic’, no light duty accommodation, previous injury with extended sick leave and specialty of first health care provider (i.e. chiropractic fared best in this study). “This confirms clinical impressions that patients with similar examination and imaging findings vary in pain and disability outcomes, likely because of factors other than biologic ones.” These groups of patients are the biggest challenge to each the individual care-giver and healthcare in general. Diminishing the prevalence and impact of chronic back and neck pain disability is the ultimate measure that the system is working.

**Long-term Patient Follow Up**

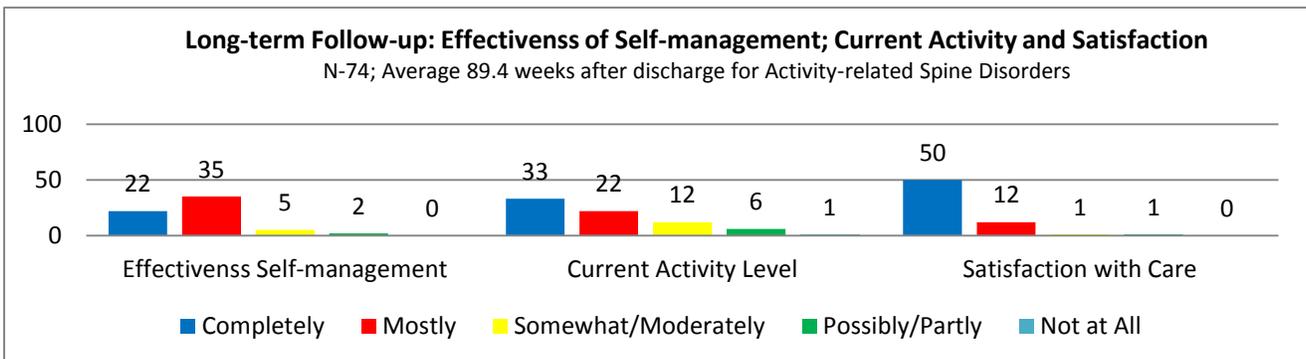
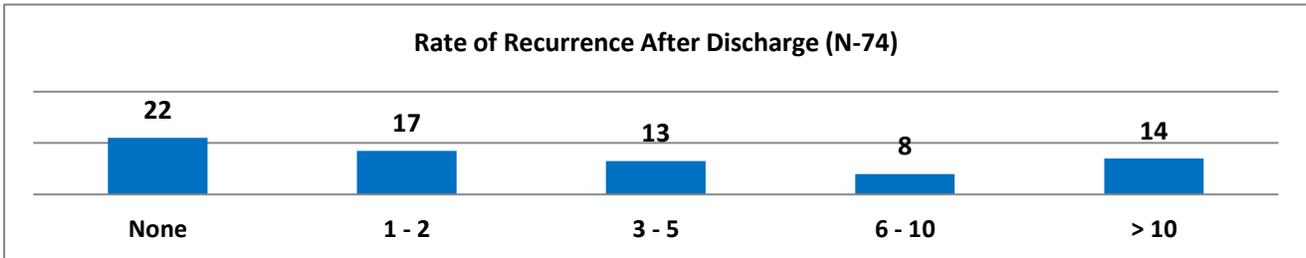
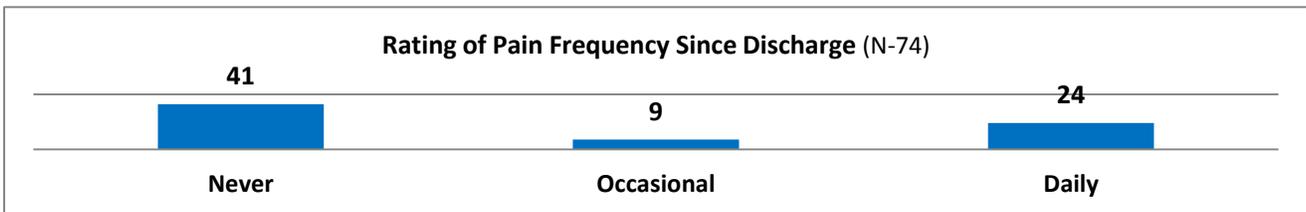
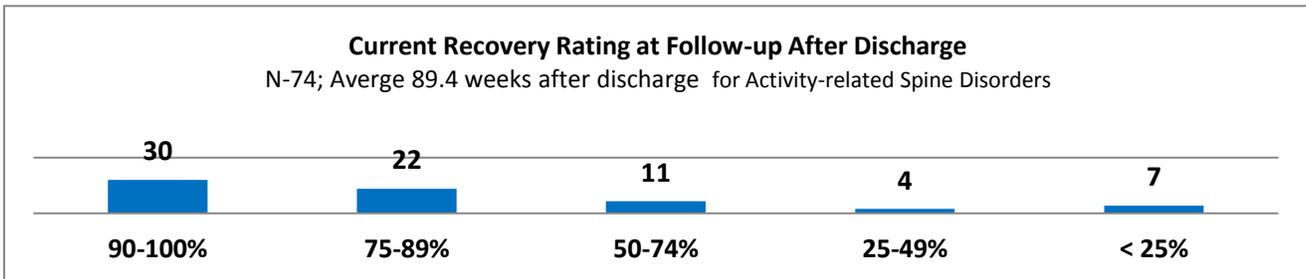
When providing our services onsite in industry we can perform informal, long-term follow-up during the weekly rounds through the work areas. This has been a great learning environment for us as you see the many issues confronting people after discharge in their struggles to stay active, healthy and in control. The office or clinical setting can be very removed from the realities facing your patients at work and at home.

We encourage formal or informal follow-up with your patients. The first follow-up survey we did was an eye-opener, the results can be found below. Patients were highly satisfied with our services, most remained active and felt the self-management instructions were helpful; but many experienced recurrences and frequent pain. Today there are many more resources available for ongoing support, guided exercise and activity than there were 20 years ago. The public is more aware of the value and importance of exercise in general, but there is still a major need for guidance to patients to find works for them. Many groups are vying to fill this need and Physical Therapy is at the lead. Amongst our many advantages is that you have many

more insights into how a problem when you are intimately familiar with resolving it – this naturally segues to prevention when your focus in treatment includes patient education and training in self-management.

**An early long-term follow-up study:** patients with ARSD treated at 2 outpatient clinics with mechanical therapy were follow-up by phone at an average of 89.4 weeks post discharge. Although many were doing well, the frequency of recurrence and a daily experience of pain drove the need for long-term planning home.

| Total | Back | Neck | Combo | QTF 1-3 | QTF 4 | Acute | Sub-Acute | Early Chronic (>7 ≤ 26 weeks) | Late Chronic (> 26 weeks) | Active | Idle |
|-------|------|------|-------|---------|-------|-------|-----------|-------------------------------|---------------------------|--------|------|
| 74    | 56   | 17   | 1     | 63      | 11    | 5     | 17        | 19                            | 33                        | 28     | 46   |



## **Summary**

Rising healthcare costs of treatment combined with increasing rates of disability resulting from chronic back and neck pain necessitate a transition to prevention-based strategies of intervention. Optimally this transition takes place before back or neck pain problems develop or recur before this common experience begins to interfere with the individual's normal level of activity; this is primary prevention. Secondary prevention commences when the individual seeks healthcare; early physical therapy should be the first choice for nonspecific ARSD provided the focus actively involves the patient, educates and trains them to control root factors and is oriented to what they must do for the long-term. Tertiary prevention should be reserved for the small group of patients with unequivocal structural pathology that is not fully reversible; sorting these patients out is the biggest challenge facing healthcare today and consequently where the greatest need for quaternary prevention exists.

In the workshop we addressed how your approach to the assessment/reassessment process can have a profound influence on the patient's long-term expectations, beliefs and levels of activity. We emphasized the importance of training the patient to take charge of their treatment by directly controlling their most relevant symptoms, signs and functional difficulties. Ultimately, they need to be empowered to take responsibility for their long-term spinal health and physical abilities. Manual therapy plays an important role to relieve symptoms and restore motion, but needs to connect to specific patient procedures that they can employ independent of the therapist. Last, routine therapeutically-based exercise is critical to recovering activity tolerance in treatment and preventing recurrence going forward. Exercise strategies need to be customized to the individual and their lifestyle demands along with specific control over their relevant symptoms, signs and activity-related difficulties.

We reviewed our approach with five core elements that are common factors for the prevention of musculoskeletal disorders and the preservation of physical abilities through a lifetime. These factors can be integrated into most methods of treatment or 'schools of thought' and facilitate recalibrating your clinical tools towards a prevention-based approach. Our premise is that all cumulative MSDs are preventable, certainly manageable and that healthcare is prevention by definition.

Thank you for your time and attention throughout the workshop; I can be contacted at [wayne@duffyath.com](mailto:wayne@duffyath.com) if you have questions or are looking for more information. I would like to thank the Utah Chapter of the APTA for inviting to present this information and the many years of support and comradery I have received from the Physical Therapy community here.

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