FIGUR8

The Need for Quantitative Analysis in the Diagnosis and Treatment of Musculoskeletal Disorders

How the empirical nature of the common clinical assessment is leading to variations in care for patients with musculoskeletal disorders.

$874B

Total costs attributed to MSK disorders per year

38%

MSK cases require 38% more time to recover than the average injury.

1 in 2

Over 50% of the population in the US suffers from some form of MSK disorder.

Musculoskeletal (MSK) disorders are among the most prevalent conditions affecting the US population and have one of the highest economic burdens (medical claims, workers compensation, disability, work replacement costs).[1,2] The total cost attributed to MSK disorders is $874 billion per year (5.7% of US GDP).[3] Specifically, soft tissue (muscle, tendon, ligament) strains/sprains are among the most common conditions affecting the lower back, upper and lower extremities followed by soft tissue tears.

Key drivers of the cost burden of care are prevalence and the wide variability of care treatment such as the inconsistent and excessive use of imaging studies, physical therapy, chronic pain treatments and surgeries.[4] It has been estimated that over a third of healthcare costs in the United States is attributed to waste and unnecessary care.[5] Costs associated with the treatment of MSK are not an exception to this finding. This is due in part to the lack of empirical testing available at the point of care (POC) to accurately and inexpensively differentiate between physiological injury and subjective complaints of pain as well as diagnoses of muscle, ligamentous, and tendinous strain/sprain and tears. A benefit of the FIGUR8 platform is that it is uniquely able to aid in the proper diagnosis of MSK disorders, hence having a positive impact on true prevalence rates and subsequent treatment decisions resulting in better clinical outcomes.

The standard clinical assessment for MSK disorders is highly subjective and includes a physical examination and most often expensive imaging studies. Typically, assessment of joint angles and muscle strength does not account for the influence of connected joints and musculature. For example, the clinician measures knee ROM with the patient lying on her back. This eliminates any contribution of influence from tightness in other muscles or joints.

> **"FIGUR8 is the only platform with the capability to evaluate muscle function in combination with 3D joint range-of-motion to guide diagnosis and treatment of MSK disorders."**

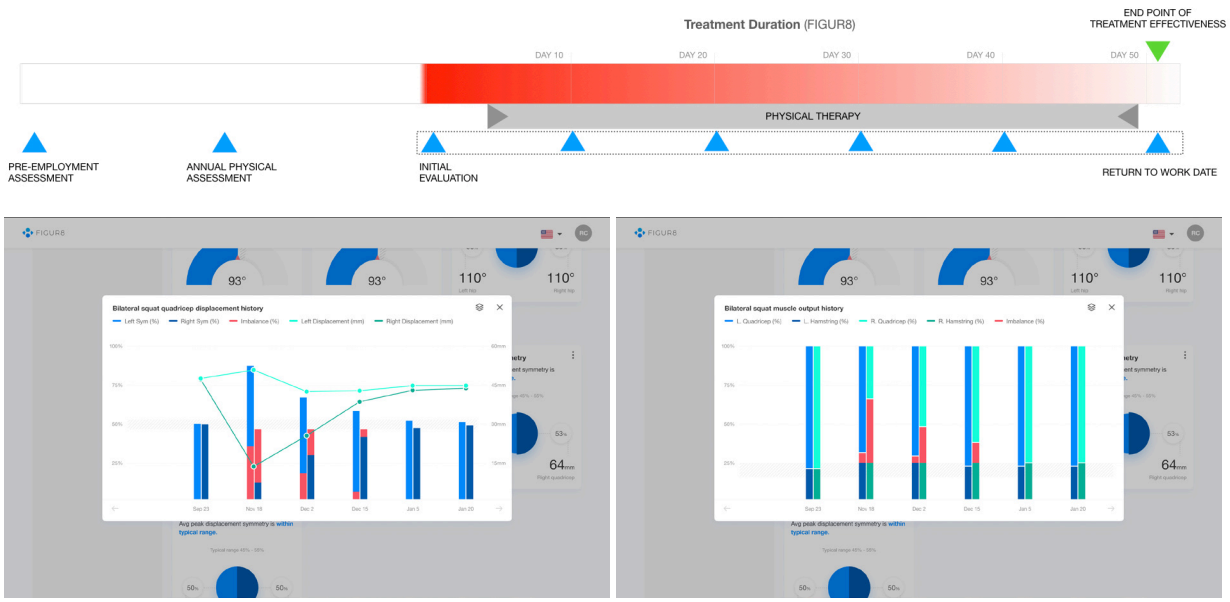
Upright, dynamic weight bearing movement assessments of lower body joint mobility and stability provide an additional comprehensive view of where a MSK dysfunction resides and how the body is compensating for an underlying impairment. However, despite scientific support of their use, such upright, dynamic, functional movement assessments are often not performed due to time constraints and/or availability of accurate, objective, and affordable biomechanical measurement systems.[6]

There is variation in clinical MSK care which is likely caused by differences in MSK examination practices, including decisions to order expensive empirical testing such as imaging studies, nerve conduction and electromyography (EMG) studies. The application of a digitized, accurate, dynamic functional movement assessment into the clinical examination workflow offers clinicians a tool to improve and lessen differences in healthcare practitioners' decision-making processes.

In the following example, the FIGUR8 Platform's Lower Body Assessment was applied to a patient. The bilateral squat activity is performed primarily to evaluate trunk and leg joint flexibility and stability- key components of movement. Available motion in one leg joint influences not only its joint angle output, but also the position and mobility of other leg joints. This introduces the concept of the lower extremity 'chain' of joints: hip, knee and ankle.

If there is a limitation in joint mobility in any of these joints, a person will demonstrate compensation in another joint(s) to accomplish the deepest squat possible, or the person will prematurely stop progressing deep into the squat. Symmetry in joint flexibility, muscle output and trunk (core) stability are assessed during descent and ascent of the squat.

Quantifying with Data: **Rehabilitation Progress of an Injury**



The initial assessment reveals movement dysfunction directing the clinician to a limitation or injury of the right ankle/foot and left quadriceps muscle. Specifically, the FIGUR8 Platform's Lower Body Assessment identified:

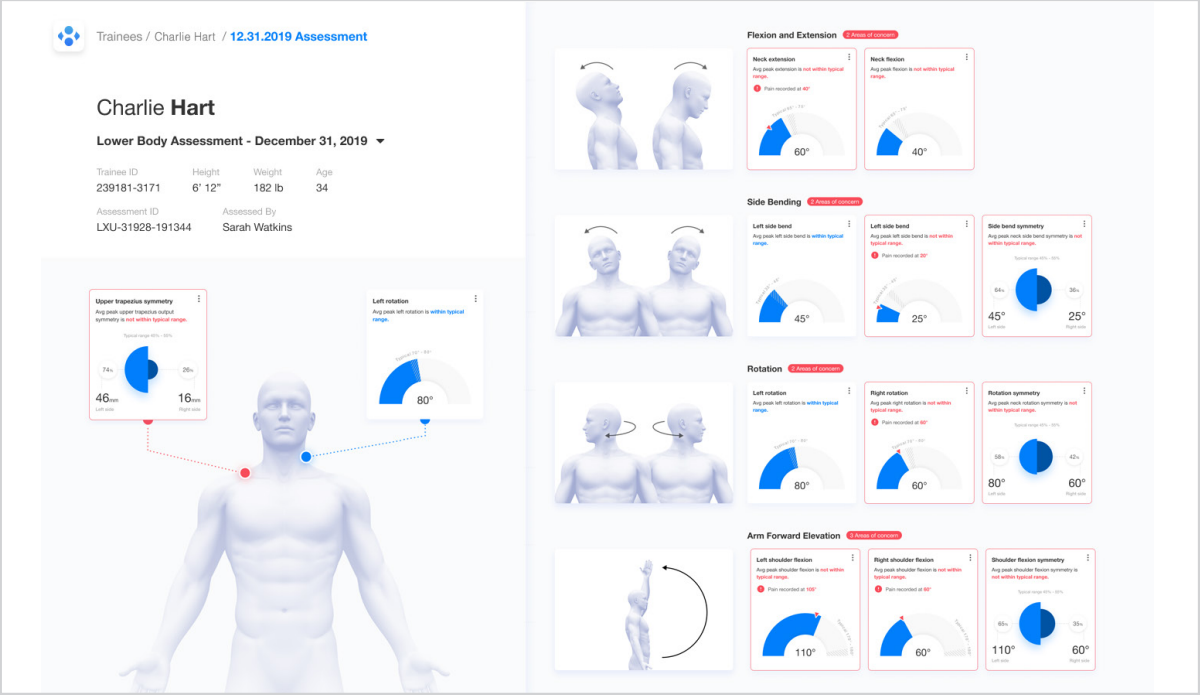
- Limited left knee and hip joint motion compared to the right side
- Significant reduction of right quadriceps output with increased reliance on the right hamstring muscle to compensate, and
- Reduced efficiency of simultaneous generation of hip and knee joint velocity.

Subsequent clinical rehabilitation for this patient included treatment to the right foot and achilles tendon as well as a progressive left quadriceps strengthening program. A follow-up Lower Body Assessment at week 4 illustrates improved movement patterns which is maintained at the assessment conducted at week 5.

The FIGUR8 Platform is highly versatile. Injury specific assessments also offer new solutions for patients, clinicians and health care systems. In the following example, the FIGUR8 Platform's Neck Assessment is applied to a patient suffering from a neck injury.

There are many muscles that work in combination to allow the head to move. Knowing that the typical weight of the adult human head is 10 -11 lbs, it is no surprise as to why the neck musculature is susceptible to strain due to poor posture or an accident. An individual with neck pain often has limited motion which can be due to a mechanical change in the spine or soft tissues as well as from the pain itself. Knowing where and when the pain occurs during neck motion gives clinicians insights to different treatment plans, but such critical information currently is difficult to standardize and is typically only captured with subjective clinical notes.

The FIGUR8 Neck Assessment brings objectivity to neck injury evaluations. As the patient bends and rotates the head across three planes of motion, FIGUR8 sensors can track the location of reported pain within these movements.



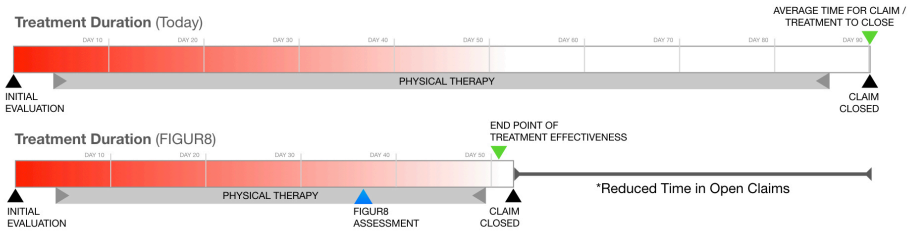
During treatment, as the patient returns for multiple visits, the FIGUR8 platform provides objective measures tracked over time, such as neck range of motion, location of pain within neck range of motion, and upper trapezius muscle output, which can lead to more effective and efficient treatment and provides a unique opportunity to normalize treatment timelines among network providers.

In the case of whiplash associated disorders, this kind of objective neck assessment has the potential to reduce the "build-up" of whiplash claims through the identification of false positives, more accurately guide treatment decisions resulting in shortened length of care timelines and open claim days, and to provide new data for the scientific categorization of the causality of injuries related to the accident.

By applying this type of qualitative evidence from the FIGUR8 Platform to clinical decision making, there is the potential to reduce unexplained care variation and association unnecessary treatment costs. Specifically, the introduction of the FIGUR8 Platform into a workflow provides the clinician with a tool to more quickly identify an area of the body requiring treatment, identify ineffective treatment methods, and reduce length of treatment.

Direct Impact : **Evidence-based MSK Health Decisions**

Assessing MSK injury with accurate data can **reduce false positive, identify ineffective treatment methods** and **reduce treatment period**.



The FIGUR8 Platform is a novel solution providing quantitative movement analysis to allow objective clinical decision making for the treating primary provider and specialist. The result is evidence-based care for improving efficacy in diagnosis and treatment of soft tissue musculoskeletal disorders.

Using FIGUR8 data, clinicians are able to accurately quantify progress and the effectiveness of treatment.

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