

Impact of Wireless Health on Proactive Loss Control and Wellness Strategies

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Abstract—The Bureau of Labor Statistics reports that despite an overall decrease in the number of workers compensation claims, indemnity, medical costs and days away from work have continued to rise. Musculoskeletal Disorders (MSD) account for 33 percent of these costs.

OSHA Defines an MSD as: “Disorders of the muscles, nerves, tendons, ligaments, joints, cartilage and spinal discs. Wireless technology will play an important role in prevention and diagnosing these injuries. In fact, today’s escalating medical costs and ever changing legal and regulatory environment necessitate proactive loss control and wellness strategies.

This paper will discuss existing evaluation and diagnostic methods as well as the new wireless EFA technology which will enable employers to proactively prevent and manage MSD cases under a broader range of conditions .

I. INTRODUCTION

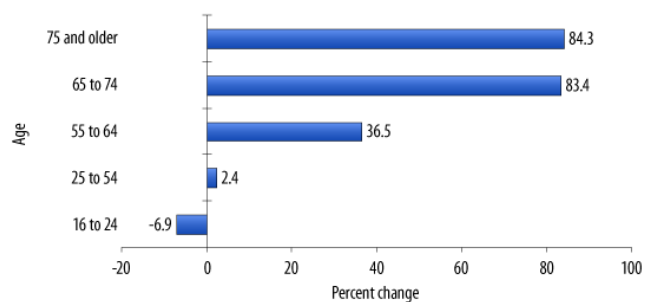
Musculoskeletal Disorders (MSD’s) represent 28% of all OSHA recordable injuries and account for 33% of the cost of worker injuries. Each OSHA recordable MSD with lost time results in an average of 20 or more lost work days compared to 9 days for all other injury causes [1] (BLS 2009).

Since the passing of the OSH Act in 1970, the regulations have encouraged an increased focus on reducing hazards causing fatalities, amputations and other serious injuries. There has been a significant decrease in the number of these types of injuries; however, MSD’s and other “soft tissue” injuries continue to plague employers.

During the next 5-years the percentage of workers ages 55-64 will increase by 36% while the percentage of workers under 25 will decline. [2] The “graying” of the American workforce will have a significant impact on wellness in the workplace and on how companies deal with this change. [3] It is important to note that the “graying” workforce is occurring in nearly all of the advanced countries of the world and business leaders must be prepared to accommodate these talented workers into their organizations.

A 2009 study written by Boston College’s Sloan Center on Aging & Work found that forty-percent of the employers surveyed fear that the aging workforce will have significant negative affects on their businesses. [3]

Projected percentage change in labor force by age, 2006-2016



Source: U.S. Bureau of Labor Statistics

www.bls.gov

Fig 1: Change in the labor force

Older workers are more susceptible to work-related MSDs than younger workers because of decreasing functional capacity including pre-existing conditions and old injuries. [4] In addition to the increased frequency of injuries, older workers have longer recovery periods which will drive up the medical and disability costs. The propensity for injury is often related to the difference between the demands of work and the worker’s physical work capacity.

Older workers bring with them knowledge, experience and a work ethic that can easily outweigh the risk of hiring the older worker. It will be critical for businesses to find a way to safely employ talented older workers and integrate them into the workforce without injury.

II. THE CHALLENGE

How do we objectively match a worker’s physical capabilities with the job’s physical demands, such as with a prospective employee or one returning from an off the job or on the job injury?

First, as part of the job design process, employers often perform a “job hazard assessment” to identify the physical

hazards and a “physical demands assessment” to quantify the physical requirements.

Current resources such as Department of Energy’s Ergo Easer, NIOSH lifting tables and Stover Snook Tables are very useful during the first step in the job design process. However, they do not provide feedback on a particular individual’s ability to perform a specific task without over-exertion.

Two of the diagnostic tools that do provide feedback on an individual’s ability to perform a task are the FCE (Functional Capacity Evaluation) and the EFA (Electrodiagnostic Functional Assessment).

The FCE lacks portability and usually requires that the employee perform the job task in a clinic using a “simulator” which will often have difficulty duplicating the job task requirements and environmental conditions. This limitation prevents “field” application under actual working conditions where the information could be used to possibly modify the job task design.



Fig 2: Example of FCE equipment in a clinical environment

The EFA (Electrodiagnostic Functional Assessment) is an objective method of assessing the functional capacity of existing and potential employees. The current technology is portable and uses a laptop computer with cables connected to the sensors placed on specific body parts to be evaluated. While this allows field application and improves mobility over traditional FCE’s, movement is still limited to the length of the 5 foot long cables.

With the development of low-power wireless sensing technology, a wireless EFA, using miniature sensors connected to a Personal Area Network (PAN), is a great step forward. This new wireless Shimmers™ technology uses 18 channels to

transmit the diagnostic level EFA test signals from the patient to the custom designed computer. The compact size (53mm x 31mm x 15mm) and flexible hardware make the wireless EFA an ideal solution when performing diagnostic testing and fit for duty evaluations.

The wireless Shimmers™ will dramatically improve freedom of movement up to at least 20 feet, allowing an increase in the field application and enabling the test subjects to complete more complex motions without the limitations of the wiring harness and EMG leads.

The portability of the unit enables on site testing and evaluation of the employee while performing the actual job task. The wireless EFA is very effective at gathering data on muscle condition and activity while in motion. The wireless EFA will have increased application outside the work environment such as in sports injury recovery and activities where speed and agility are important motions to measure.

The data collected from the Shimmers™ is transmitted to the nearby laptop and the diagnostic data is displayed in graphs. The graphs identify specific muscle groups which may be fatigued, have limited range of motion, demonstrate compensation or are in spasm due to overuse or injury.

The EFA uses five independent components which include the FCE in the portable unit. The components are:

- Surface EMG
- Dynamic Range of Motion
- Pinch
- Grip
- FCE

The EFA uses the diagnostic level Surface EMG. This is an important differentiation from other devices that use “bio-feedback” level Surface EMG as classified by the Food and Drug Administration (FDA). [6]



Fig 3: Example of EFA test equipment and Shimmers™



Fig 4: Example of wireless Shimmers™ sensors in use while pushing equipment on site.

The field application will also provide immediate feedback to enable changes to the job task design and the ability to quickly re-evaluate the impact on the employee's physical demands. This increase in efficiency will be a powerful tool for employers as they begin to "re-engineer" the workplace for the future. This will also ensure regulatory compliance.

When the EFA test is used to evaluate the job demands and the subject's ability to perform the task safely, the data will answer the following:

- Does the subject have an MSD that would prevent him/her from safely performing the job tasks?
- Did the subject perform the tasks without fatigue?
- Did the subject put forth effort?
- Does the subject have adequate range of motion to perform the task?
- Does the subject have enough strength to perform the task?
- Are there steps in the job process that could be reasonably modified to fall within the physical capabilities of the subject?

When the EFA is used post-injury as a "Fit for Duty" exam to assess a recovering subject's ability to return to work, the data will determine the following:

- Have the injured muscles have recovered to pre-injury status or if there is some impairment?
- Is the range of motion and endurance sufficient to perform the job tasks?
- Is this a case for which the employer has a legitimate responsibility?
- Suggest site specific treatment recommendations, when appropriate, thereby avoiding unnecessary costs in the treatment process.

III. DISCUSSIONS

Safety is an investment in future profitability for every employer. A typical organization such as a manufacturers, warehouse/distribution, construction company, healthcare institutions and transportation companies will find that a large portion of their injury cases will involve strains and other soft tissue injuries.

Most companies struggle with reducing the number and cost of soft tissue injuries. For the average employer, 30% of their injuries are soft tissue and for some companies it can be as high as 60%. [1] Many of these injuries are work related and others may involve off the job or old injuries that the employer was not responsible for causing.

One study found that as much as 73% of pain and discomfort claimed to be work related was caused by unrelated pathology and was not a new injury. [7]

The EFA test is an effective tool to determine whether the complaints presented are consistent with job duties or the date of the incident and the injury description.

The combination of using the wireless Shimmers™ during the EFA test will improve mobility during the test to evaluate broader range of work activities under the following situations:

- Determining "fitness for duty"
 - Capability to perform the physical demands of the job
 - Prior injury limitations
 - Normal decrease in functional capacity
- Re-engineering work procedures
 - Reduction in physical demands
 - Improved comfort
 - Improved efficiency
- Accuracy of diagnosis
 - Identify legitimate injury cases
 - Identify fraudulent injury cases
- Accuracy of treatment
 - Reduced employee frustration
 - Shorter treatment times
 - Shorter disability period
- Return to work
 - Objectively determine when is an employee is at MMI (maximum medical improvement)
 - Determine ability to perform the physical demands of the job

IV. CASE SUMMARY

Case #1: The EFA was instrumental in closing a back claim with an estimated savings of \$100,000.

The patient was not working prior to the EFA, had a positive MRI finding and rated his pain as a 6 to 10 out of 10. The EFA found that the disc pathology was not related to or aggravated by the date of loss and he had only minimal myofascial pathology. He was treated for the myofascial pathology as outlined in the EFA recommendations and the case was resolved.

The designated treating physician confirmed the EFA findings and the employee was at MMI (maximum medical improvement) with a 0% impairment rating. The claim closed.

This patient was over 65 years old and the EFA results showed that all of the degenerative changes were not related to or aggravated by the date of loss.

V. CONCLUSION

The wireless EFA technology is an important new tool that will enable gathering data on the physical demands of the job and how well individuals perform under actual working conditions in the field. The freedom of movement allowed by the wireless Shimmer™ technology is critical to gathering data under actual working conditions.

Older workers bring with them knowledge, experience and a strong work ethic that can easily outweigh the increased risk of injury. It will be critical for businesses to find a way to safely employ these talented older workers and integrate them into the workforce without injury.

American businesses will need to make use of innovative tools such as the wireless EFA to reduce the risk of injuries and improve productivity to remain competitive globally.

VI. REFERENCES

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