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Celebrating 20 Years at the Forefront of Disability Medicine
Evidence-Based Practice Approaches and Return-To-Work Outcomes: Some Insights for Independent Medical Examiners

The seminal study by the Institute of Medicine and the adoption of the IOM’s findings by various august bodies of medicine, as well as the trail blazing work of the Cochran Collaborative, has led the house of medicine to better understand, appreciate and incorporate evidence-based approaches in formulating best practice guidelines.

The philosophy as well as the core methodology of evidence-based practice (EBP) and evidence-based medicine (EBM) have been established for well over a decade in most healthcare professions; however, their use is not evenly distributed across the wide spectrum of Health Care Providers. In fact, some insurers complain that too often clinicians follow “…nonspecific practices, haphazard planning, a lack of goal setting which causes an inability to measure efficacy and accurate progress, and that there is no standard database in the field” (Robinson, 2008). To a large degree some of these comments could very well apply to the Practitioner of Disability Medicine as quite often opinions regarding Dis/Ability are based on nonspecific, vague, subjective rather than objective evidence base criteria. It is incumbent on specialists in disability medicine to take a leadership role in using the tools that are available in combination with developing evaluative studies in order to maximize health care and thus clinical outcomes as well as reduce needless impairment and disability.

This issue of Journal of Disability Medicine (JDM) focuses on a set of studies that highlight the importance of examining evidence-based approaches in work conditioning/hardening vis-à-vis the most frequently occurring work-related injuries, post-treatment outcomes as judged by a patient’s ability to return to work. These articles focus on the injuries of the cervical spine that result in a fusion procedure, lumbar spine injuries that are treated without surgical intervention as well as those with level 1, 2 or 3 fusions, and ACL repairs. Our intention is to spotlight promising findings as a focal collection of scientific research articles.

It has been known for some time now that the peer reviewed scientific literature lacks or provides limited research in certain areas of Disability Medicine, and this new original research approach by JDM seeks to fill some of the gap.

I hope that you find these research focused articles useful and that it would lead to future ideas and topics for further research. As the Journal of Disability Medicine continues to grow and evolve, we plan to have periodic special topics editions that focus on a particular area of disability medicine. We would welcome individuals willing to server as guest editors to compile collections of high quality studies to submit to the journal for peer reviewed consideration. Individuals interested in developing a topical focused issue of the JDM, should communicate with Dr. Chris Stout, Acquisitions Editor, at chris.stout@atipt.com.

I would welcome debate/discussion on any and all of these articles in the form of letters to the editor and would welcome your ideas for topics of your research interest in the Disability Medicine.

Mohammed Ranavaya, MD, JD, MS, FRCPI, FFOM
Editor in Chief, Journal of Disability Medicine
President, American Board of Independent Medical Examiners
Return-to-Work Outcomes in Non-operative Lumbar Cases Following An Evidence-Based Post-surgical Rehabilitation Program

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Abstract:
Background: Low back pain in injured workers that are involved in the workers’ compensation system is fairly low at about 16% of claims. However, while low in frequency, such claims are high in costs, accounting for 33%. A quarter of these low back pain cases were responsible for almost all (96%) of the costs. Further compounding problematic aspects in the care of individuals having workers’ compensation (WC) coverage is that there is robust literature that indicates that as a group, WC cases generally have much poorer clinical outcomes and lower rates of satisfaction than their non-WC counterparts who have received care for low back pain. In spite of a successful physical therapy rehabilitation, some patients continue to have physical limitations that prevent them from being able to return to work or achieve the same physical demand level. Traditional work conditioning/hardening programs generally evaluate outcomes via return-to-work (RTW) results.

Purpose: Compare the outcomes of patients who have had physical therapy rehabilitation who then participated in an evidence-based sports performance-based work conditioning/work hardening (EbSpWC/WH) program on RTW outcomes in the context of post test physical demand levels (PDLs), with patients from non evidence based programs identified in the literature.

Study Design: Retrospective, case series, observational study.

Methods: Patients were sampled from a multisite rehabilitation practice that sampled from Midwest and East Coast sites. A blinded review of a data-run based on the inclusion and exclusion criteria was conducted. Subjects in this study had complaints of low back pain and they all had completed an EbSpWC/WH program during the period of time between February 2009 and May 2012, after completing a course of physical therapy. Physical demand level (PDL) of the patient’s job (pre-injury) and post-treatment PDL was collected as the primary outcome measure. Following completion of physical therapy, patients underwent an evidence-based, sports performance-based work conditioning/hardening (EbSpWC/WH) program 5 hours a day, 5 days a week.

Results: Of the 135 patients who met inclusion/exclusion criteria, 101 achieved a positive outcome, thus accounting for a 75.0% return to work rate at the same physical demand level in an average of 3.13 +/- 0.7 months. During this time, the average number of physical therapy sessions was 19.55 +/- 13.01 and the average number of evidence-based work conditioning/hardening program sessions was 26.14 +/- 10.85.

Conclusion: This study showed that 75% of workers with lumbar spine injuries who were able to complete the program also successfully returned to their desired PDL in 3 months. The results found in this study were consistent with that demonstrated in other work conditioning/hardening literature while this study defined success by a measure that may be a more rigorous measure (PDL). While, the utilization of this program may cost more initially, there is literature to suggest that an evidence based work conditioning/hardening program may decrease overall costs in the management of injured workers with low back pain.

Keywords: Lumbar; Low back pain, Return to work, Evidence-based, Work conditioning; Work hardening; Physical demand level; Workers’ compensation

Introduction
Pain is generally the most frequent cause for an individual to seek medical attention. Healthcare professionals and general practitioners’ practices are made up of a high number of patient visits due to low back pain.1-2 This level of demand in the United States seems to border epidemic proportions in that one survey found between 48% and 60% of adults presenting for care had suffered from some type of back pain in the prior quarter.1 As a result of this high utilization, the costs associated with direct treatment are estimated to total $30.3 billion annually and with an additional $14.0 billion resulting from indirect costs such as lost productivity.1,3

When specifically examining the prevalence of low back pain in injured workers that are involved in the workers’ compensation system the level is fairly low at about 16% of claims. However, while low in frequency, such claims are high in costs accounting for 33%. Upon further examination, a quarter of the low back pain cases were responsible for almost all (96%) of the costs.4 While the costs of medical services
have increased across the board, the largest proportion of increased expenditure is in workers’ compensation cases. In a study by Maetzel and Li, the average annual number of days lost to low back injuries was 149 million with a concomitant value in lost productivity of $28 billion.

Further compounding problematic aspects in the care of individuals having workers’ compensation (WC) coverage is that there is robust literature that indicates that as a group WC cases generally have much poorer clinical outcomes and lower rates of satisfaction than their non-WC counterparts who have received care for low back pain.

Physical therapy modalities have been studied as a viable treatment for low back pain although disagreement exists as to the extent of its benefits and efficacy. Recent studies advocate the use of manual physical therapy and exercise for short term and long term reductions in pain reduction, as well as lower healthcare utilization rates. Additionally, superior cost-effectiveness has been demonstrated with manual physical therapy and exercise over general practitioner care and standard physical therapy.

Cole et al examined such a sample but in the context of physiological and functional measures of strength development. Their study made the point that while other studies report the outcome measure of return to work (RTW), they generally do not also consider the physical demand level (PDL) of the job to which they are returning. More recent studies have begun to consider these more crucial aspects when examining workers’ compensation cases’ outcomes.

In spite of a successful physical therapy rehabilitation, some patients continue to have physical limitations that prevent them from being able to return to work or to be able to return to the same job as they had prior to the injury, or at the same physical demand level. Traditional work conditioning (WC) or work hardening (WH) programs help to improve patients’ independent functioning in their daily lives (unassisted dressing, grooming, feeding, ambulating, etc.) and re-establishing their work-related functioning.

Work conditioning programs are generally comprised of a “single-disciplinary treatment approach to address physical or functional needs using physical conditioning and functional activities related to work.” Work hardening programs are defined as multidisciplinary models of care designed to address physical, functional, behavioral, and vocational needs, and uses real or simulated work activities. Both of these approaches generally evaluate outcomes via RTW results. Again, there is a paucity of research findings on the consequences of undergoing such programs and what has been investigated found contradictory evidence.

Also absent from the literature is an investigation of the outcome of patients who have had physical therapy rehabilitation who then participated in an evidence-based sports performance-based work conditioning/work hardening (EbSpWC/WH) program on RTW outcomes in the context of prior-to-injury PDLs. The authors investigated a sample of workers’ compensation patients who had undergone physical rehabilitation followed by successful completion of an EbSpWC/WH program. The hypothesis was that such WC patients would show a higher level of returning to work and return to work more quickly (at their prior PDL) than those patients described other studies’ findings that did not complete a evidence-based rehabilitation protocol.

Patients and Methods

Study Design

An uncontrolled, multicenter, retrospective, observational study of WC patients who completed an evidence-based sports performance-based work conditioning/work hardening program at a large, multisite rehabilitation practice that sampled from midwest sites East Coast. A blinded review of a data-run based on the inclusion and exclusion criteria was conducted.

Patient Population

Subjects in this study had complaints of low back pain (resultant from a diagnosis of spondylolysis, spondylolisthesis, herniated nucleus pulposus, radiculopathy, or degenerative disk disorder, rehabilitation and were also workers’ compensation...
cases. They all had completed an EbSpWC/WH program during the period of time between February 2009 and May 2012.

**Inclusion Criteria**
1) Presence of low back pain that is at a debilitating level,
2) Completion of traditional physical therapy,
3) Physician referral for work conditioning or work hardening,
4) Patient had to have 10 or more sessions in the program (at least 2 weeks), and
5) Approval of coverage from workers’ compensation insurance.

**Exclusion Criteria**
1) Prior lumbar surgery,
2) Cauda equina syndrome,
3) Scoliosis > 15 degrees,
4) Segmental instability,
5) Vertebral fractures,
6) Spine infection or tumor,
7) Inflammatory spondyloarthropathy,
8) Pregnancy,
9) Prior history of cervical fusion,
10) Non-compliance or inability to perform program at least 4 h/d, 4–5 days/wk,
11) Inability to complete at least 4 weeks full progression EbSpWC/WH program,
12) Incomplete data, and/or
13) No longer had a job to return to.

**Collected Data and Outcome Measures**
The organization’s practice is to collect a standardized set of data that includes patient demographic information (e.g., age, sex, BMI, etc.), WC status, a detailed medical history that includes acuity or chronicity of comorbidities, occupation, physical demand level (PDL) of the patient’s job (pre-injury) and post-treatment PDL. PDL is based on the US Department of Labor’s Dictionary of Occupational Titles, and include Sedentary Work, Light Work, Light/Medium, Medium Work, Medium/Heavy, Heavy Work, and Very Heavy Work. (Definitions for these categories appear in Table 1.) And lastly, the results of Functional Capacity Evaluations when conducted were also included.

**Treatment Protocol**
Following completion of physical therapy, patients underwent an evidence-based, sports performance-based work conditioning/hardening (EbSpWC/WH) program which is a rehabilitation program that employs the principles of sports performance training to improve WC patients’ physical lifting capacity. The program is individualized, based primarily around the injured worker’s presenting level of function, with an identified return-to-work end-goal in mind. Patients come to the program Mondays through Fridays for approximately 5 hours a day. Depending on the idiopathic needs and progress of the patient, this generally is five weeks in duration, and less for patients in less physically demanding job classifications.

The evidence-base for the program used was developed based on expert consensus from a multidisciplinary group that included orthopedic surgeons, physical therapists, athletic trainers, exercise physiologists, and bio-mechanists as well as a systematic review of the literature for available randomized control trials and meta-analytic survey findings in order to inform the design of the return-to-work program. In the development of the SPWC/H program (formally known as Functional Integration of Rehabilitation and Strength Training, FIRST™), research was conducted to examine the hypothesis that improving lifting abilities in injured workers translated into improved return to work performance. In a 2002 study of WC patients who were assessed at both 1-year and 2-years post-program completion indicated that 97% of those patients went back to work, with half being able to return back to their prior occupation and concomitant PDL. Additionally, re-injury rates were assessed for these patients two years following program completion and were found to be rare and occurred less frequently with greater physical demand jobs.

Outcomes were defined as returning to work and at what level, and the time period between presenting to treatment and maximum medical improvement (MMI) in order to return to work. The determination for returning to work was based on a formal evaluation (functional capacity evaluation—FCE) or by meeting their target PDL in the RTW program. The authors
herein believe this to be a more strict method in which to determine functional outcome of the patient rather than other studies\(^{27}\) that have based the decision for the patient to return to work on the more subjective opinion of the physician or patient-subjective measures of pain or functionality. Work level was defined via physical demand level (e.g., Sedentary Work, Light Work, Medium Work, Heavy Work, and Very Heavy Work).

**Statistical Analysis**

Arithmetic means and standard deviations were the descriptive statistics used in the case of continuous data while discrete data were represented by frequency count and percentages. Welch’s t-test was performed to determine differences between groups and non-parametric Chi Square for within groups and p-values <0.05 was the criterion for statistical significance. Statistical analyses that were not performed by hand used Microsoft Excel or SPSS for Windows 16.0 (SPSS, Inc., Chicago, IL).

**Results**

From February 2009 to May 2012, 135 consecutive patients who met the inclusion and exclusion criteria and were under workers’ compensation for their low back pain we studied. The details of this sample’s demographic and historic characteristics are detailed in Table 2. The mean average age of the sample was 41.71 +/- 9.99 years (range, 20 to 66 years). Males comprised 73% (n=99) of the sample and 27% (n=36) were female.

In terms of work levels of the patients herein, two patients were employed at a sedentary level of work and 13 patients had been at a light work level. Light/Medium work levels accounted for 14 patients. The majority were the medium level at 39. Thirty-five were at medium/heavy and 19 were classified at a heavy work level, and the remainder, 13 were at a very heavy level of work. Of the 135 patients, 101 were able to reach their same level of pre-injury work, thus accounting for a 75.0% return to work rate at the same physical demand level. When examining the time it took to achieve their maximum medical improvement, the mean average was 3.13 +/- 0.7 months. During this time, the average number of physical therapy sessions was 19.55 +/- 13.01 and the average number of evidence-based work conditioning/hardening program sessions was 26.14 +/- 10.85. When examining patient outcomes by work classification, it was found that there were no statistically significant differences between the categories (Fig 1).

![Figure 1. Percentage of patients returning to work at the same physical demand level as prior to injury (NS, p<0.05)](image)

When examining the 34 patients that were not able to return to work at their previous levels following therapy and evidence-based rehabilitation, there were no obvious pathognomonic indications noted that may have contributed to their sub-optimal clinical outcomes. Inferential statistical analyses were conducted in order to examine if any differences manifest between the patient groups who achieved their target, preoperative work level and those that that did not, and none were significant. When examining the most frequently occurring comorbidities (smoking, prior surgeries, high blood pressure, or allergies) it was found that the two groups did not significantly differ (p>0.05). Similarly, when comparing on demographic variables of sex or age, no statistically significant differences were found.

**Discussion**

**Analysis of the Results**

During retrospective analysis of this information, it was hypothesized that an EbSpWC/WH program would return workers to their job faster and return to work at their same or higher PDL when compared to patients from non-evidence based programs. In a review of the literature on patients with low back pain and who also underwent work
Table 1. Physical Demand Definitions*

<table>
<thead>
<tr>
<th>Work Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Sedentary Work</td>
<td>Exerting up to 10 pounds of force occasionally (Occasionally: activity or condition exists up to 1/3 of the time) and/or a negligible amount of force frequently (Frequently: activity or condition exists from 1/3 to 2/3 of the time) to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met.</td>
</tr>
<tr>
<td>L-Light Work</td>
<td>Exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force frequently, and/or a negligible amount of force constantly (Constantly: activity or condition exists 2/3 or more of the time) to move objects. Physical demand requirements are in excess of those for Sedentary Work. Even though the weight lifted may be only a negligible amount, a job should be rated Light Work: (1) when it requires walking or standing to a significant degree; or (2) when it requires sitting most of the time but entails pushing and/or pulling of arm or leg controls; and/or (3) when the job requires working at a production rate pace entailing the constant pushing and/or pulling of materials even though the weight of those materials is negligible. NOTE: The constant stress and strain of maintaining a production rate pace, especially in an industrial setting, can be and is physically demanding of a worker even though the amount of force exerted is negligible.</td>
</tr>
<tr>
<td>M-Medium Work</td>
<td>Exerting 20 to 50 pounds of force occasionally, and/or 10 to 25 pounds of force frequently, and/or greater than negligible up to 10 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Light Work.</td>
</tr>
<tr>
<td>H-Heavy Work</td>
<td>Exerting 50 to 100 pounds of force occasionally, and/or 25 to 50 pounds of force frequently, and/or 10 to 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Medium Work.</td>
</tr>
<tr>
<td>V-Very Heavy Work</td>
<td>Exerting in excess of 100 pounds of force occasionally, and/or in excess of 50 pounds of force frequently, and/or in excess of 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Heavy Work.</td>
</tr>
</tbody>
</table>

* According to the Physical Demand Definitions from the Dictionary of Occupational Titles (US Department of Commerce)

Table 2. Demographic and Historic Characteristics of Lumbar Pain Cohort

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristic</th>
<th>+ Outcome (n=101)</th>
<th>- Outcome (n=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age by end of program</td>
<td>41.71 +/- 9.99</td>
<td>40.46 +/- 10.02</td>
<td>43.25 +/- 9.74</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>73% (n=99)</td>
<td>74% (n=75)</td>
<td>71% (n=24)</td>
</tr>
<tr>
<td>Female</td>
<td>26% (n=26)</td>
<td>26% (n=26)</td>
<td>29% (n=10)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking, 32% (n=32)</td>
<td>Smoking, 35% (n=12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgeries, 31% (n=31)</td>
<td>Hernia, 12% (n=4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure, 18% (n=18)</td>
<td>Headache, 12% (n=4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allergies, 17% (n=17)</td>
<td>Asthma, 12% (n=4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>1% (n=2)</td>
<td>0</td>
<td>6% (n=2)</td>
</tr>
<tr>
<td>Light</td>
<td>10% (n=13)</td>
<td>3% (n=3)</td>
<td>29% (n=10)</td>
</tr>
<tr>
<td>Light/Medium</td>
<td>10% (n=14)</td>
<td>7% (n=7)</td>
<td>21% (n=7)</td>
</tr>
<tr>
<td>Medium</td>
<td>29% (n=39)</td>
<td>31% (n=31)</td>
<td>24% (n=8)</td>
</tr>
<tr>
<td>Medium/Heavy</td>
<td>26% (n=35)</td>
<td>28% (n=28)</td>
<td>21% (n=7)</td>
</tr>
<tr>
<td>Heavy</td>
<td>14% (n=19)</td>
<td>19% (n=19)</td>
<td>0</td>
</tr>
<tr>
<td>Very Heavy</td>
<td>10% (n=13)</td>
<td>13% (n=13)</td>
<td>0</td>
</tr>
<tr>
<td>Return to Work at Pre-Injury Level</td>
<td>Yes, 75%</td>
<td>No, 25%</td>
<td></td>
</tr>
</tbody>
</table>
conditioning/hardening, their success rate was typically defined as the percentage who RTW and ranged from 30-87%. Duration was usually described in terms of total visits and/or time from injury/admission through RTW and ranged from less than 5 visits to over 50 and/or 4-17 weeks, respectively. This observation, however, is not surprising considering that as many as 19 different factors have been identified as significant contributors to RTW in patients with lumbar spine injuries and the patient populations that were examined, while suffering LBP, may have varied significantly from that examined here, as well as, from each other.

Lindstrom, in one of the few studies to use a true control group, reported return to work rates (80%) similar to the 75% RTW rate found in this study. Sachs reported that 78% of the patients in their study were able to increase their “weight capacity,” however, without classification based on PDL, it is difficult to make comparisons. The study herein demonstrated an average of 3 months for return to work while utilizing approximately 20 physical therapy sessions and 25 work conditioning/hardening sessions. Overall, the duration/frequency of this study is consistent with ranges found in the literature. This study, however, used a standard of measure (PDL) that is arguably a more rigorous test of physical function than the outcome of RTW used in most studies. It is possible, therefore, that these results may be biased towards failure and the results of EbSpWC/WH program used in this study should be interpreted carefully.

Cost Effectiveness

The question of efficacy is always a concern with growing healthcare demands, especially when compared to surgical intervention. A comparison of EbSpWC/WH to surgical intervention is a particularly valid aspect of this study because surgery can or could have been a possible option for many of the patients referenced. Mayer found decreased rates in subsequent surgical intervention and healthcare utilization in a group of nonoperative LBP patients completing work conditioning/hardening when compared to a group receiving denials from their respective insurance carriers. This group was twice as less likely to go on to have surgery and utilized five-times less MD visits in the first 2 years. Work conditioning/hardening programs were found to contribute between $3,000 and $9,000 in additional medical costs. However, when all indirect costs were accounted for (lost wages/productivity, reinjury for example), such a program saved $1600 per patient, totaling $1.5 million in cost reductions for patients with soft tissue lower back injuries.

The American Academy of Orthopaedic Surgeons (AAOS) published the actual mean reimbursement for the 5 years post lumbar fusion at $22,000, with the mean actual reimbursement for the procedure itself was $17,000. These data indicate that work conditioning/hardening programs, when appropriate by a collaborating healthcare team, can be an acceptable and cost effective treatment option for long term management of patients with low back pain who are trying to return to work.

Limitations

One of the main limitations of this study is the lack of a control and group and the retrospective analysis. These data offer insight to future research but offers limited benefit for the treating clinicians deciding on treatment options in a prospective manner. Few studies to date have appropriately utilized a control group when examining work conditioning/hardening programs and even fewer have utilized a prospective design. However, many utilize comparison groups comprised of patients who have been denied by their insurance carriers. This between-group variability and bias is an intuitive threat to the validity of these comparisons but can offer a different dimension of analysis than that offered here. Another limitation is the lack of long term follow-up. Follow up of 2 years has captured additional medical usage rates of 33% and reinjury rate of 6%. One benefit of examining the PDL of the patient is the ability to determine a possible relationship between higher PDL and decreased rates of reinjury.

Conclusions

To date, there is a lack of research characterizing the effectiveness of an evidence-based sports performance-based work conditioning/work hardening (EbSpWC/WH) program. This study showed that 75% of workers with lumbar spine injuries able to complete
this program, successfully returned to their desired PDL in 3 months. While, the utilization of this program may contribute to additional direct medical costs with an average of 25 work conditioning/hardening sessions following an average course of 19 physical therapy visits, similar work conditioning/hardening programs have been shown to decrease indirect costs and be more cost effective overall. Otherwise, the results found in this study were consistent with that demonstrated in the literature, while defining success on an outcome measure that may be more rigorous.

Future research should include the use of PDL as a standard measure to provide a degree of change attained and help insulate the effect the program from the wide array of variables influencing the RTW statistic. Also, work should be done to perform long term follow up on these patients as they return to the jobs and lifestyles that contributed to the onset of injury initially. Lastly, future research should consider utilizing a control/comparison group with a prospective design to facilitate a more practical application for healthcare professionals.

References


24. Key Method Functional Capacity Evaluations.[Internet]. Carlsbad: Key Functional Assessments, Inc.; Available from: http://www.keymethod.com) when conducted were


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An Evidence-Based Approach to Improved Return-To-Work Outcomes in Cervical Disk Fusions in a Workers’ Compensation Population

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Abstract:

Background: According to national administrative data, there has been an increase in the number of spinal fusions, particularly cervical fusions, conducted. This increase prompts the concern as to therapeutic efficacy. Researchers have noted a lack of evidence for treatment efficacy in fusions and there has been a fair amount of unsatisfactory outcomes reported in the literature. Studies investigating workers’ compensation (WC) patients show that this population tends to have even poorer outcomes than the general patient population, but few of these articles examine the outcomes of cervical fusions conducted in WC populations who had undergone an evidence-based work-condition/work-hardening program as part of their post-operative rehabilitation protocol.

Purpose: The purpose of this work is to investigate a sample of WC patients who had undergone cervical fusion to determine whether the patients who participated in an evidence-based sports performance work conditioning/work hardening (EbSpWC/WH) program would show a higher frequency of returning to work and return to work in a rapid manner.

Study Design: This is a retrospective, case series, observational study which took place at a large, multisite rehabilitation practice in the Midwest and East Coast.

Methods: A blinded review of a data-run based on inclusion and exclusion criteria was conducted and it resulted in 72 eligible subjects for study.

Results: Of the 72 patients, 47 were able to reach their same level of pre-injury work, thus accounting for a 65.0% return to work rate at the same physical demand. This took an average of 3.57 +/- 0.93 months, 25.94 +/- 10.59 physical therapy sessions, and 25.33 +/- 13.41 evidence-based work conditioning/hardening program sessions.

Conclusion: While there may be additional controversy involved with examining the clinical outcomes of workers’ compensation populations in addition to patients undergoing cervical fusions, there does appear to be now more optimistic outcomes when such patient populations have their episode of care augmented with an evidence-based sports-performance work conditioning/hardening program. Further investigation, development, and refinement of such programs appear to be warranted areas for fertile future investigation.

Keywords: Cervical spine, cervical fusion, neck, back pain, Return to work, Evidence-based, Work conditioning; Work hardening; Physical demand level; Workers’ compensation

INTRODUCTION

A recent epidemiological study by Rajae, et al¹ looking at national administrative data on the national trends of spinal fusions in the United States between 1998 to 2008 found continuing confirmation of the increase in the number of fusions conducted. While they looked at numerous types of fusions (e.g., thoracic and lumbar as well as cervical), the largest increases in fusion procedure rates were for lumbar and cervical. And within this increase, cervical fusions accounted for 114% of the uptick. This is a further trending uptick from past studies’ findings as well.²

With such increases also come concerns as to therapeutic efficacy. Researchers have noted a lack of evidence for treatment efficacy in fusions and there has been a fair amount of unsatisfactory outcomes reported in the literature.³⁻⁵

This then begs the question as to whether there are like results in an injured worker population. Many studies of individuals on workers’ compensation resultant from suffering their injuries while working often demonstrate poorer outcomes with less predictability/consistency, less satisfaction, and greater costs.⁶⁻¹⁷ One study examined the outcomes of workers’ compensation patients who had undergone fusion procedures as a result of workplace trauma. One group had undergone one procedure and was evaluated on average 51 months postoperatively and the other that had patients who had undergone two or more spine surgeries group was evaluated 38 months later. The patients in the single-operation group had a 71% not-returning-to-work outcome, while only 5% of the multiple-operations group had returned-to-work after three years.¹⁸ This is similar to the findings of Bhandari...
et al\textsuperscript{19} that at almost three years post-operatively, 38% still had not returned to work of any kind, even less physically demanding than their pre-injury physical demand level.

There are few published studies examining the outcomes of cervical fusions conducted in workers’ compensation (WC) populations who had undergone an evidence-based work-condition/work-hardening program as part of their post-operative rehabilitation protocol, thus the interest of the researchers in this current investigation. When looking at the time to return-to-work, Steinmetz and his colleagues\textsuperscript{20} found an average of 222 days for patients undergoing cervical fusion, but they did not look at patients who had additionally undergone an evidence-based work conditioning program as well.

The authors investigated a sample of WC patients who had undergone cervical fusions. The hypothesis was that WC patients who, following the surgical procedure and then participating in an evidence-based sports performance work conditioning/work hardening (EbSpWC/WH) program, would show a higher frequency of returning to work and return to work in a rapid manner.

METHODS

Subjects in this study had undergone a cervical fusion and were also workers’ compensation cases. They were at least 3 months post-operative and had completed an evidence-based work conditioning/work hardening rehabilitation program during the period of time between March 2009 and December 2011. The surgeons were a heterogeneous group made up of 39 different specialists in either sports medicine or orthopedic spinal surgery.

The inclusion and exclusion criteria were as follow:

**Inclusion Criteria**

1) Workers’ compensation case,
2) at least one cervical level surgically fused,
3) completion of traditional physical therapy,
4) physician referral for work conditioning or work hardening,
5) approval of coverage from workers’ compensation insurance, and
6) no previous cervical fusion surgery.

**Exclusion Criteria**

1) Non-compliance or inability to perform program at least 4 h/d, 4–5 days/wk,
2) inability to complete at least 4 weeks full progression EbSpWC/WH program,
3) Incomplete data, or
4) no longer has a job to return to.

**Medically, Exclusion Criteria were:**

1) prior cervical surgery,
2) Cauda equina syndrome,
3) Scoliosis > 15 degrees,
4) Segmental instability,
5) Vertebral fractures,
6) Spine infection or tumor,
7) Inflammatory spondyloarthropathy,
8) Pregnancy,
9) Comorbid conditions contraindicating surgery, and
10) The inability or unwillingness to have surgery within 6 months.

A blinded review of a data run based on the inclusion and exclusion criteria was conducted by a large, multisite rehabilitation practice on WC patients who were sampled from sites in the Midwest and East Coast. The organization’s practice is to collect a standardized set of data that includes patient demographic information (age, sex, BMI, etc.), WC status, a detailed medical history that includes chronicity and acuity of comorbidities, occupation, physical demand level (PDL) of the patient’s job (pre-injury) and post-treatment PDL based on the US Department of Labor’s Dictionary of Occupational Titles\textsuperscript{21} and include Sedentary Work, Light Work, Light/Medium, Medium Work, Medium/Heavy, Heavy Work, and Very Heavy Work. (Definitions for these categories appear in Table 1.) And lastly, the results of Functional Capacity Evaluations\textsuperscript{22} when conducted were also included.

Patients herein underwent Anterior Cervical Diskectomy and Fusion (ACDF). This is the most common procedure for cervical radiculopathy. The intent is to restore the alignment of the spine as well as protect the compartment for nerve roots to leave the spine and to restrict movement in the area of the injured portion of the spine.\textsuperscript{23} In order to stabilize the area, a metal plate and screws are generally implanted around
the damaged area which also helps to speed the rate of the fusion.

Following the fusion procedure, patients had 2–6 weeks of rest followed by physical therapy. Patients then underwent an evidence-based, sports performance-based work conditioning/hardening (EbSpWC/WH) program. This a rehabilitation program that employs the principles of sports performance training to improve WC patients’ physical lifting capacity. The program is individualized and based primarily around the injured worker’s presenting level of function, with an identified return-to-work end-goal. Patients participate in the program Mondays through Fridays for approximately 5 hours a day. Depending on the idiopathic needs and progress of the patient, the program is generally five weeks in duration, and less for patients in less physically demanding job classifications.

The evidence-base for the program was developed based upon expert consensus from a multidisciplinary group that included orthopedic surgeons, physical therapists, athletic trainers, exercise physiologists, and bio-mechanists. Additionally, a systematic review of the literature for available randomized control trials and meta-analytic survey findings was completed in order to design the return-to-work program. In the development of the EbSpWC/WH program (formally known as Functional Integration of Rehabilitation and Strength Training, FIRST™), research was conducted to examine the hypothesis that improving lifting abilities in injured workers translated into improved return to work performance. In a 2002 study of WC patients who were assessed at both 1-year and 2-years post-program completion indicated that 97% of those patients went back to work, with 50% being able to return back to their prior occupation and concomitant physical demand level. Additionally, re-injury rates were assessed for these patients two years following program completion and were found to be rare and occurred less frequently with greater physical demand jobs. 25

Outcomes were defined as returning to work and at what level, and the time period between the surgery and maximum medical improvement (MMI) in order to return to work. The determination for returning to work was based on a formal evaluation (functional capacity evaluation) or by meeting their target PDL in the RTW program. The authors herein believe this to be a more strict method in which to determine functional outcome of the patient. Other studies26 have based the decision for the patient to return to work on the more subjective opinion of the physician. Work level was defined via physical demand level (e.g., Sedentary Work, Light Work, Medium Work, Heavy Work, and Very Heavy Work).

Descriptive statistics used in the case of continuous data were arithmetic means and standard deviations. For discrete data, frequency counts and percentages were used. For inferential analyses, p-values <0.05 was the criterion for statistical significance and Welch’s t-test was performed to determine differences between groups and non-parametric Chi Square for within groups. Statistical analyses that were not performed by hand used Microsoft Excel or SPSS for Windows 16.0 (SPSS, Inc., Chicago, IL).

RESULTS

From March 2009 and December 2011, 72 consecutive patients who met the inclusion and exclusion criteria having had a cervical fusion were examined. The details of this sample’s demographic and historic characteristics are detailed in Table 2. The mean average age of the sample was 43.67±8.96 years (range, 26 to 65 years of age). Males comprised 68.1% (n=49) and 31.91% (n=23) were female.

Patients sampled have undergone 1, 2 or 3 level cervical fusions, performed by one of 39 different orthopedic specialists. The goals of these procedures were to decompress nerves, to maintain spine stability, and to provide correct alignment of the cervical spine subsequent to a work related injury. 23

Prior to incurring the injury, three patients were employed at a sedentary level of work and 13 patients had been at a light work level. Light/medium work levels accounted for eight patients, 18 were at the medium level. Sixteen were at medium/heavy and 6 were classified at a heavy work level, and the remaining eight were at a very heavy level of work. Of the 72
Table 1. Physical Demand Definitions*

<table>
<thead>
<tr>
<th>Work Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Sedentary Work</td>
<td>Exerting up to 10 pounds of force occasionally (Occasionally: activity or condition exists up to 1/3 of the time) and/or a negligible amount of force frequently (Frequently: activity or condition exists from 1/3 to 2/3 of the time) to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met.</td>
</tr>
<tr>
<td>L-Light Work</td>
<td>Exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force frequently, and/or a negligible amount of force constantly (Constantly: activity or condition exists 2/3 or more of the time) to move objects. Physical demand requirements are in excess of those for Sedentary Work. Even though the weight lifted may be only a negligible amount, a job should be rated Light Work: (1) when it requires walking or standing to a significant degree; or (2) when it requires sitting most of the time but entails pushing and/or pulling of arm or leg controls; and/or (3) when the job requires working at a production rate pace entailing the constant pushing and/or pulling of materials even though the weight of those materials is negligible. NOTE: The constant stress and strain of maintaining a production rate pace, especially in an industrial setting, can be and is physically demanding of a worker even though the amount of force exerted is negligible.</td>
</tr>
<tr>
<td>M-Medium Work</td>
<td>Exerting 20 to 50 pounds of force occasionally, and/or 10 to 25 pounds of force frequently, and/or greater than negligible up to 10 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Light Work.</td>
</tr>
<tr>
<td>H-Heavy Work</td>
<td>Exerting 50 to 100 pounds of force occasionally, and/or 25 to 50 pounds of force frequently, and/or 10 to 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Medium Work.</td>
</tr>
<tr>
<td>V-Very Heavy Work</td>
<td>Exerting in excess of 100 pounds of force occasionally, and/or in excess of 50 pounds of force frequently, and/or in excess of 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Heavy Work.</td>
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</tbody>
</table>

* According to the Physical Demand Definitions from the Dictionary of Occupational Titles (US Department of Commerce)

Table 2. Demographic and Historic Characteristics of Cervical Fusion Cohort

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristic</th>
<th>+ Outcome (n=47)</th>
<th>- Outcome (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age by end of program</td>
<td>43.67 +/- 8.96</td>
<td>44.94 +/- 8.88</td>
<td>41.28 +/- 8.80</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>68.1% (n=49)</td>
<td>72.3% (n=34)</td>
<td>60% (n=15)</td>
</tr>
<tr>
<td>Female</td>
<td>31.9% (n=23)</td>
<td>26.7% (n=13)</td>
<td>40% (n=10)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High blood pressure 29.78% (n=14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headaches 29.78% (n=14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dizziness/Fainting 24% (n=6)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Smoking 19.14% (n=9)</td>
<td></td>
<td></td>
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<tr>
<td>Depression 20% (n=5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dizziness/Fainting 14.89% (n=7)</td>
<td></td>
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</tr>
<tr>
<td>Diabetes 20% (n=5)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Depression 14.89% (n=7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking 20% (n=5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>4% (n=3)</td>
<td>2% (n=1)</td>
<td>8% (n=2)</td>
</tr>
<tr>
<td>Light</td>
<td>18% (n=13)</td>
<td>6% (n=3)</td>
<td>40% (n=10)</td>
</tr>
<tr>
<td>Light/Medium</td>
<td>11% (n=8)</td>
<td>4% (n=2)</td>
<td>24% (n=6)</td>
</tr>
<tr>
<td>Medium</td>
<td>25% (n=18)</td>
<td>34% (n=16)</td>
<td>8% (n=2)</td>
</tr>
<tr>
<td>Medium/Heavy</td>
<td>22% (n=16)</td>
<td>23% (n=11)</td>
<td>20% (n=5)</td>
</tr>
<tr>
<td>Heavy</td>
<td>8% (n=6)</td>
<td>13% (n=6)</td>
<td>0</td>
</tr>
<tr>
<td>Very Heavy</td>
<td>11% (n=8)</td>
<td>17% (n=8)</td>
<td>0</td>
</tr>
<tr>
<td>Return to Work at Pre-Injury Level</td>
<td>Yes, 65%</td>
<td></td>
<td>No, 35%</td>
</tr>
</tbody>
</table>
patients, 47 were able to reach their same level of pre-injury work, thus accounting for a 65.0% return to work rate at the same physical demand level. When examining the time it took to achieve their maximum medical improvement, the mean average was 3.57 +/- 0.93 months. During this time, the average number of physical therapy sessions was 25.94 +/- 10.59 and the average number of evidence-based work conditioning/hardening program sessions was 25.33 +/- 13.41. When examining patient outcomes by work classification it was found that there were no statistically significant differences between the categories (Fig 1).

**Figure 1. Percentage of patients returning to work at the same physical demand level as prior to injury (NS, p>0.05)**

When examining the 25 patients that were not able to return to work at their previous levels following their cervical fusion procedure and evidence-based rehabilitation, there were no obvious pathognomonic indications noted that may have contributed to their sub-optimal clinical outcomes. Inferential statistical analyses were conducted in order to examine if any differences manifest between the patient groups who achieved their target, preoperative work level and those that that did not, and none were significant. When examining the most frequently co-occurring comorbidities (headaches, smoking, dizziness/fainting, and depression) it was found that the two groups did not significantly differ (p>0.05). Similarly, when comparing on demographic variables of sex or age, no statistically significant differences were found.

**DISCUSSION**

Surgery is a critically necessary albeit costly intervention in the treatment of cervical injuries. There is controversy in the literature concerning the quality of outcomes and the time required for a patient undergoing the procedure to be able to return back to work, especially at the same level as was performed prior to the injury\(^\text{18-20}\)

However, the initial findings herein suggest that more favorable outcomes can be augmented if an evidence-based post-operative rehabilitation program is also employed in the episode of care. This study was the first of its kind to examine a population of workers’ compensation patients having had both cervical fusion procedure and undergone an evidence-based rehabilitation program. Our results indicate that such a group has a 65.0% return to work rate within 3.57 months. When compared to other studies of workers’ compensation populations having had cervical fusions\(^\text{20}\) the findings herein are markedly faster to RTW (107 days herein versus 222 days) when an evidence-based program is used by the patients.

This study is not without its limitations. Studies such as this include the fact that there was not a direct comparison group of patients with like-injuries and treatment but who were not injured workers. However, such is not directly appropriate, as by definition, that cohort would not undergo a return to work rehabilitation program.

Additionally, it has been noted in the literature\(^\text{27}\) that when investigating the population of workers’ compensation patients, that the outcome of returning to work co-varies with a number of other aspects. They can include what state a worker is employed in (due to differences in the law), regional practice pattern variations, levels of family income, available social support to the patient, economic factors such as unemployment and recessionary periods, psychological aspects (e.g., fear-avoidance, substance abuse, mood disorders), and so on. All of these factors conspire to limit the overall generalizability of any study, and thus should be kept in mind. Having noted this, it is nevertheless important in the differential therapeutic
decision making process for healthcare providers and case managers alike to be well informed as to the state of the literature on relevant outcomes when making treatment decisions as well as informing the injured worker (and perhaps employer) and establishing appropriate treatment expectations.

This study has avoided contamination that could be present vis-à-vis patient expectations or biases of patient self-selection. Albeit a retrospective design with the concomitantly associated weakness, it is believed that such an approach is the most fitting and has the least amount of drawbacks.

**CONCLUSION**

While there may be twice the controversy involved with examining the clinical outcomes of workers’ compensation populations in addition to patients undergoing cervical fusions, there does appear to be new more optimistic outcomes when such patient populations have their episode of care augmented with an evidence-based sports-performance work conditioning/hardening program. Further investigation, development, and refinement of such programs appear to be warranted areas for fertile future investigation.

**REFERENCES**


Return-to-Work Outcomes in Anterior Cruciate Ligament Reconstruction Cases Following an Evidence-Based Post-surgical Rehabilitation Program

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Abstract:

Background: Studies have found that one of the most frequently ruptured ligaments is the anterior cruciate ligament (ACL). While the literature indicates that the reconstructive procedure performed on ACL ruptures generally yields positive clinical outcomes in athletes, there is very little published research on outcomes of this procedure for workers’ compensation (WC) populations.

Purpose: The purpose of this article is to examine the effects of WC patients’ involvement in an evidence-based sports performance work conditioning and hardening (EbSpWC/WH) program, how quickly they were able to return to work, and whether the work they returned to was of the same physical demand level as the patients’ pre-injury work level.

Study Design: This is an uncontrolled, multicenter, retrospective, and observational study which took place at a large, multisite rehabilitation practice in the states of Illinois and Wisconsin.

Methods: All 43 subjects had undergone both a reconstruction of a ruptured ACL and postoperative rehabilitation, including an EbSpWC/WH program. A blinded review of a data-run based on inclusion and exclusion criteria was conducted.

Results: Results of this study indicated that of the 43 WC patients studied, 34 were able to achieve their same level of pre-injury work, thus accounting for a 79.1% return-to-work rate at the same/prior physical demand level. In order to reach their maximum medical improvement, the subjects attended an average of 42.47 +/- 19.58 physical therapy sessions and an average of 25.77 +/- 10.43 work conditioning program sessions over the course of an average of 5.17 +/- 2.07 months.

Conclusion: Surgical reconstruction of ruptures of the anterior cruciate ligament resultant from workplace injuries, followed by post-operative rehabilitation and an evidenced-based work conditioning/work hardening program appear to have a positive effect on return to work rates. There is also indication that not all workers’ compensation cases are subject to poor outcomes when compared to non-workers’ compensation ACL injured cohort patients.

Keywords: Anterior cruciate ligament reconstruction, Return to work, Evidence-based, Work conditioning; Work hardening; Physical demand level; Workers’ compensation

Introduction

A summary1 of prior studies has found that one of the most frequently injured ligaments that individuals suffer ruptures is the anterior cruciate ligament (ACL). These ruptures result in pain, restricted range of motion, instability in the effected knee and often functional deficits as well2. The literature indicates that the reconstructive procedure done to remedy ACL ruptures generally yields a positive clinical outcome of a return to knee-stability along with a return to athletic ability on par with pre-injury levels, and positive patient satisfaction.3-19

The question has been raised however, as to whether there are like results in an injured worker population. Many studies of individuals on workers’ compensation resultant from suffering their injuries while working often demonstrate poorer outcomes with less predictability/consistency, less satisfaction, and greater costs.2,3,20-29 Fewer still are published articles concerning ACL outcomes in workers’ compensation (WC) populations. Wexler and his colleagues3 found that WC patients had good outcomes following ACL reconstruction; however they did not distinguish what the Physical Demand Level (PDL) was of their sample. In 2001 Barrett et. al2 specifically examined a WC population that underwent ACL reconstructions, but their focus concerned patient perceptions.

Absent from all of the literature reviewed was an examination of WC patient outcomes following ACL reconstruction and subsequent participation in an evidence-based work conditioning and hardening
program who were able to return-to-work (RTW) at their pre-injury physical demand level. Thus, this current work sought to examine the effects of WC patients’ involvement in such a program on how quickly they were able to not only return-to-work, but also whether that “work” was at the same physical demand level as they were capable of prior to their injury.

Patients and Methods

Study Design

This design is an uncontrolled, multicenter, retrospective, observational study of WC patients who completed an evidence-based sports performance work conditioning/work hardening (EbSpWC/WH) program at a large, multisite rehabilitation practice in the states of Illinois and Wisconsin. A blinded review of a data-run based on the inclusion and exclusion criteria was conducted.

Patient Population

Subjects in this study had undergone a reconstruction of a ruptured anterior cruciate ligament, postoperative rehabilitation and were also workers’ compensation cases. They were at least two months (ranging from 2 months, 17 days to 13 months, 19 days) postoperative and had completed an EbSpWC/WH program during the period of time between February 2009 and November 2011. The surgeons were a heterogeneous group made up of 34 different specialists in either orthopedic medicine and/or sports medicine.

Inclusion Criteria

1) Workers’ compensation case,
2) ruptured anterior cruciate ligament,
3) underwent either arthroscopic-assisted or endoscopic ACL reconstruction using patellar tendon autograph,
4) completion of traditional physical therapy,
5) physician referral for work conditioning or work hardening.

Exclusion Criteria

1) Prior ACL reconstruction,
2) Non-compliance or inability to perform program at least 4 hours/day 4–5 days/week,
3) inability to complete at least 4 weeks full progression in a EbSpWC/WH program,
4) incomplete data, or
5) no longer had a job to return to.

Collected Data and Outcome Measures

It is the organization’s practice to collect a standardized set of data that include patient demographic information (e.g., age, sex, BMI, etc.), WC status, a detailed medical history (noting acuity or chronicity of any comorbidities), occupation, physical demand level (PDL) of the patient’s job (pre-injury) and post-treatment PDL. PDL is based on the US Department of Labor’s Dictionary of Occupational Titles, and include Sedentary Work, Light Work, Light/Medium, Medium Work, Medium/Heavy, Heavy Work, and Very Heavy Work. (Definitions for these categories appear in Table 1.) And lastly, the results of Functional Capacity Evaluations when conducted were also included.

Although there are many methods of reconstructing a ruptured ACL, they all involve replacing what is left of the original ACL fibers with tissue from a different part of the body, which is called a “graft.” Grafts are usually tendons from the patella, hamstring, or quadriceps of either the patient (autograft), or a cadaver (allograft).

After acquiring the graft, a surgeon will use a series of arthroscopic and/or open incisions to drill openings into the bone on the top and the bottom of the knee. The surgeon then places the graft into the openings. Finally, the surgeon secures the graft with screws. Usually the patient is able and allowed to bend his or her knee per protocol after the surgery, but will be fitted with a knee brace during the initial healing process.

Treatment Protocol

Following the ACL reconstruction, patients underwent a standard post-operative rehabilitative physical therapy protocol. Physician specific protocol was utilized if and when provided. After completion, they then underwent an evidence-based, sports performance-based work conditioning/hardening (EbSpWC/WH) program which is a rehabilitation program that employs the principles of sports performance training to improve WC patients’ physical
lifting capacity. The program is individualized, based primarily around the injured worker’s presenting level of function, with an identified return-to-work end-goal in mind. Patients come to the program Mondays through Fridays for approximately five hours a day. Depending on the idiopathic needs and progress of the patient, this generally is five weeks in duration, and less for patients in less physically demanding job classifications.

The evidence-base for the program used was developed based on expert consensus from a multidisciplinary group that included orthopedic surgeons, physical therapists, athletic trainers, exercise physiologists, and bio-mechanists as well as a systematic review of the literature for available randomized control trials and meta-analytic survey findings in order to inform the design of the return-to-work program. In the development of the EbSpWC/WH program (formally known as Functional Integration of Rehabilitation and Strength Training, FIRST™), research was conducted to examine the hypothesis that improving lifting abilities in injured workers translated into improved return to work performance. In a 2002 study of WC patients who were assessed at both 1-year and 2-years post-program completion indicated that 97% of those patients went back to work, with half being able to return back to their prior occupation and concomitant PDL. Additionally, re-injury rates were assessed for these patients two years following program completion and were found to be rare and occurred less frequently with greater physical demand jobs.

Outcomes were defined as returning to work and at what level, and the time period between the surgery and maximum medical improvement (MMI) in order to return to work. The determination for returning to work was based on a formal evaluation (functional capacity evaluation) or by meeting their target PDL in the RTW program. The authors herein believe this to be a more strict method in which to determine functional outcome of the patient. Other studies have based the decision for the patient to return to work on the more subjective opinion of the physician. Work level was defined via physical demand level (e.g., Sedentary Work, Light Work, Medium Work, Heavy Work, and Very Heavy Work).

Statistical Analysis
Descriptive statistics of arithmetic means and standard deviations were used for continuous data while discrete data were represented by frequency count and percentages. Welch’s t-test was performed to determine differences between groups and non-parametric Chi Square for within groups. P <0.05 was the criterion for statistical significance. All descriptive and analytic statistical analyses were performed using Microsoft Excel or SPSS for Windows 16.0 (SPSS, Inc., Chicago, IL).

Results
From February 2009 to November 2011, 43 consecutive patients who met the inclusion and exclusion criteria and were under workers’ compensation for their ACL injury were included in this study. Patients who met criteria having had an ACL reconstructive surgery that was arthroscopic-assisted or endoscopic using patellar tendon autograph were included. The details of this sample’s demographic and historic characteristics are detailed in Table 2. The mean average age of the sample was 40.60 +/- 9.76 years (range, 61 to 21 years). Males comprised 86% (n=37) of the group and 14% (n=6) were female. Patient-subjects represent a heterogeneous group having their surgical intervention done by one of 34 different orthopedic surgeons. This was followed by a standard post-op rehabilitation protocol, unless physician directed alternatively.

Most ACL ruptures result from non-contact mechanisms and are often associated with a combination of deceleration and pivoting movements or unusual landings. Females have a higher tendency to injure the ACL than males. Studies attribute this to differences in muscular strength, conditioning, and pelvic alignment among other things.

Outcomes were defined as returning to work and at what level, and the time period between the surgery and maximum medical improvement (MMI) in order to return to work. The determination for returning to work was based on a formal evaluation (functional capacity evaluation) or by meeting their target PDL in the RTW program. The authors herein believe this to be a more strict method in which to determine functional outcome of the patient. Other studies have based the decision for the patient to return to work on the more subjective opinion of the physician. Work level was defined via physical demand level (e.g., Sedentary Work, Light Work, Medium Work, Heavy Work, and Very Heavy Work).
at either the sedentary or light levels of work prior to injury. Of the 43 patients, 34 were able to achieve their same level of pre-injury work, thus accounting for a 79.1% return to work rate at the same/prior physical demand level. When examining the time it took to achieve their maximum medical improvement, the mean average was 5.17 +/- 2.07 months. During this time, the average number of physical therapy sessions was 42.47 +/- 19.58 and the average number of evidence-based work conditioning/hardening program sessions was 25.77 +/- 10.43. When examining patient outcomes by work classification, it was found that there were no statistically significant differences between the categories (Fig 1). PDL was not found to significantly impact either return to work or time to recovery.

![Figure 1](image.png)

**Figure 1.** Percentage of patients returning to work at the same physical demand level as prior to injury (NS, p>0.05)

When examining the 9 patients that were not able to return to work at their previous levels following ACL reconstruction and evidence-based rehabilitation, there were no obvious pathognomonic indications noted that may have contributed to their sub-optimal clinical outcomes. Inferential statistical analyses were conducted in order to examine if any differences manifest between the patient groups who achieved their target, preoperative work level and those that that did not, and none were significant. When examining the most frequently occurring comorbidities (high blood pressure, smoking, allergies, and diabetes) it was found that the two groups did not significantly differ (p>0.05). Similarly, when comparing on demographic variables of sex or age, no statistically significant differences were found.

**Discussion**

This study was unique in a few ways. First, the researchers were interested in the objective findings of injured workers’ ability to return to work who had undergone an ACL reconstruction, rather than prior investigations looking at subjective reports of outcomes that was in the literature. Secondarily, researchers herein were also interested in learning how return-to-work outcomes may be impacted if they followed successful ACL reconstruction and physical therapy with participation in an evidence-based, sports performance-based work conditioning/hardening program. Such programs are relatively few and unique, so this aspect of inquiry was of keen interest.

It is the opinion of the authors herein that using Physical Demand Levels of a worker’s pre-injury job level as the criterion to successful post-surgical and post-rehabilitation is a better criterion of success—certainly as it avoids the potential bias of the surgeon as well as the subjectivity of the patient him/herself. And, in a way it is perhaps an even more challenging outcome to achieve for the worker as other studies have looked at returning to work at a level that is not necessarily the same level of demand or, in some cases, even less physically demanding.

While there are no statistically significant differences between the groups vis-à-vis work level, that is the program seemed to benefit all injured workers regardless of job duties and demands, it is nevertheless interesting to note that the best outcomes were in the highest Physical Demand Levels (i.e., Heavy and Very Heavy). This suggests that the evidence-based program may exert more impact in more physically demanding job categories, and perhaps have less influence in less demanding positions.
### Table 1. Physical Demand Definitions *

<table>
<thead>
<tr>
<th>Work Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Sedentary Work</td>
<td>Exerting up to 10 pounds of force occasionally (Occasionally; activity or condition exists up to 1/3 of the time) and/or a negligible amount of force frequently (Frequently: activity or condition exists from 1/3 to 2/3 of the time) to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met.</td>
</tr>
<tr>
<td>L-Light Work</td>
<td>Exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force frequently, and/or a negligible amount of force constantly (Constantly: activity or condition exists 2/3 or more of the time) to move objects. Physical demand requirements are in excess of those for Sedentary Work. Even though the weight lifted may be only a negligible amount, a job should be rated Light Work: (1) when it requires walking or standing to a significant degree; or (2) when it requires sitting most of the time but entails pushing and/or pulling of arm or leg controls; and/or (3) when the job requires working at a production rate pace entailing the constant pushing and/or pulling of materials even though the weight of those materials is negligible. NOTE: The constant stress and strain of maintaining a production rate pace, especially in an industrial setting, can be and is physically demanding of a worker even though the amount of force exerted is negligible.</td>
</tr>
<tr>
<td>M-Medium Work</td>
<td>Exerting 20 to 50 pounds of force occasionally, and/or 10 to 25 pounds of force frequently, and/or greater than negligible up to 10 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Light Work.</td>
</tr>
<tr>
<td>H-Heavy Work</td>
<td>Exerting 50 to 100 pounds of force occasionally, and/or 25 to 50 pounds of force frequently, and/or 10 to 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Medium Work.</td>
</tr>
<tr>
<td>V-Very Heavy Work</td>
<td>Exerting in excess of 100 pounds of force occasionally, and/or in excess of 50 pounds of force frequently, and/or in excess of 20 pounds of force constantly to move objects. Physical Demand requirements are in excess of those for Heavy Work.</td>
</tr>
</tbody>
</table>

*According to the Physical Demand Definitions from the Dictionary of Occupational Titles (US Department of Labor)*

### Table 2. Demographic and Historic Characteristics of ACL Reconstruction Cohort

<table>
<thead>
<tr>
<th>Category (N= 43)</th>
<th>+ Outcome (n= 34)</th>
<th>- Outcome (n= 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age by end of program</td>
<td>40.60 +/- 9.76</td>
<td>40.67 +/- 9.00</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>86 % (n= 37)</td>
<td>85% (n=29)</td>
</tr>
<tr>
<td>Female</td>
<td>14 % (n= 6)</td>
<td>15% (n=5)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>21% (n=7)</td>
<td>22% (n=2)</td>
</tr>
<tr>
<td>Metal Implants</td>
<td>18% (n=6)</td>
<td>11% (n=1)</td>
</tr>
<tr>
<td>Recent Fractures</td>
<td>15% (n=5)</td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>15% (n=5)</td>
<td></td>
</tr>
<tr>
<td>Work Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Light</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Light/Medium</td>
<td>7% (n=3)</td>
<td>6% (n=2)</td>
</tr>
<tr>
<td>Medium</td>
<td>28% (n=12)</td>
<td>21% (n=7)</td>
</tr>
<tr>
<td>Medium/Heavy</td>
<td>26% (n=11)</td>
<td>24% (n=8)</td>
</tr>
<tr>
<td>Heavy</td>
<td>14% (n=6)</td>
<td>18% (n=6)</td>
</tr>
<tr>
<td>Very Heavy</td>
<td>26% (n=11)</td>
<td>32% (n=11)</td>
</tr>
<tr>
<td>Return to Work at Pre-Injury Level</td>
<td>Yes, 79% (n=34)</td>
<td>No, 21% (n=9)</td>
</tr>
</tbody>
</table>
While many past studies examining the population of workers’ compensation, as a group, generally have poorer outcomes when measured on a myriad of factors—satisfaction, clinical outcome, exacerbated comorbidities, slower rehabilitation, clinical management issues, and so forth when compared with non-worker’s compensation patients undergoing ACL reconstruction, this study’s findings were actually more like that of non-WC populations. This may be due to greater satisfaction in simply having a good outcome and being successfully restored to a prior injury level of functionality. It may also be an artifact of the process that patients go through in their program. The nature of the program lends itself to much individual support and group support for the others participating in the program. Future studies should investigate these additional psychological and social aspects that are concomitant to the nature of the program.

While this study’s findings suggest that participation in an evidence-based, sports performance-based work conditioning/hardening program is helpful following ACL reconstruction in order to be able to return to the same level of work as was achieved prior to the injury, there were limitations that should be noted. Foremost, there was no control group to compare with the sample studies herein. Ideally having such would add to the strength and confidence of findings. Future studies should consider adding a comparison control group when possible.

**Conclusions**

Surgical reconstruction of ruptures of the anterior cruciate ligament resultant from workplace injuries, followed by post-operative rehabilitation and an evidenced-based work conditioning/work hardening program appear to have a positive effect on return to work rates. There is also indication that not all workers’ compensation cases are subject to poor outcomes when compared to non-workers’ compensation ACL injured cohort patients.

**References**


**CONTINUED FROM PAGE 9**


AMA Guidelines and The 2011 Amendments To The Illinois Workers’ Compensation Act (page 26)

Please pick the best answer of the 4 possible answers from the following.

1. A permanent partial disability impairment report shall include an evaluation of medically defined and professionally appropriate measurements of impairment that include, but are not limited to:
   a) Loss of strength
   b) Loss of range of motion
   c) Measured atrophy of tissue mass consistent with the injury
   d) All of the above

2. Worker’s compensation is supposed to pay benefits for:
   a) Repetitive Trauma
   b) Accidental Injuries
   c) Cumulative Trauma
   d) All of the above
3. In determining the level of permanent partial disability, the Commission shall base its determination on:
   a) Occupation of the injured employee
   b) The age of the employee at the time of injury
   c) The employee’s future earning capacity
   d) All of the above

4. The argument in favor of adopting the AMA Guidelines was based on:
   a) Complaints from employers
   b) Complaints and concerns monetary awards to injured workers varied greatly
   c) Complaints from taxpayer
   d) None of the above

5. In the following example: a physicist and a pianist both suffer amputation of the non-dominant little finger. Both have the same ratable “impairment:” 100% of digit, 10% of the hand, 9% of the upper extremity and 5% of the whole person. In comparing the loss of the digit to the job, which of the following statement is correct?
   a) Neither the physicist nor the pianist has measurable “disability”
   b) Only the physicist has measurable “disability”
   c) Only the pianist has measurable “disability”
   d) Both the physicist and the pianist have measurable “disability”

6. According to the 6th Edition of the AMA Guidelines which eliminates a good deal of the subjectivity of its previous versions, the final impairment rating is determined by:
   a) The patient’s self-description
   b) The description from the patient’s employer
   c) The physician’s diagnosis and perception of severity.
   d) None of the above

An Evidence-Based Approach to Improved Return-To-Work Outcomes in Cervical Disk Fusions in a Workers’ Compensation Population (page 10)

Please pick the best answer of the 4 possible answers from the following.

1. Evidence-Based Work Conditioning and Work Hardening program for post operative cervical fusion in WC patients has:
   a) Mostly negative outcomes
   b) More optimistic outcomes
   c) No difference in clinical outcomes
   d) Very negligible outcomes

2. Of the numerous types of spinal fusion procedures, the largest number in US between 1998 and 2008 are:
   a) Cervical
   b) Lumbar
   c) Thoracic
   d) Not sure

3. As per the report of Bhandari et al, the % of WC injured workers that could return to work after spinal fusion is:
   a) 55
   b) 68
   c) 38
   d) 48

4. WC patients who participate in EbSp program show:
   a) Disability to return to work
   b) Slow progress in returning to work
   c) Higher frequency and faster in returning to work.
   d) Unwillingness in returning to work

5. The difference in time taken to return to work when Eb program is used and not used by the WC patients having Cervical fusion is:
   a) 190----
   b) 107----
   c) 200----
   d) 220----

6. The EbSp WC/WH or FIRST program helps the injured workers in improving:
   a) Lifting abilities
   b) RTW performance
   c) Reducing rate of re-injury
   d) All of the above
Return-to-Work Outcomes in Anterior Cruciate Ligament Reconstruction Cases Following an Evidence-Based Post-surgical Rehabilitation Program (page 16)

Please pick the best answer of the 4 possible answers from the following.

1. Anterior cruciate ligament (ACL) is
   a) one of the frequently injured ligaments
   b) one of the very rarely injured ligaments
   c) one of the ligaments that never get ruptured
   d) one of the ligaments that can not be reconstructed

2. Who have a higher tendency to injury the ACL
   a) Males
   b) Children
   c) Females
   d) Aged-above 70

3. The impact of EbSP WC/WH program on high PDL job categories of ACL injured WC patients is
   a) Less than in less demanding job categories
   b) More than in less demanding job categories
   c) The same as in less demanding job categories
   d) Not at all significant

4. When compared to non Work comp cases of ACL injured patients, all Work comp cases are
   a) Subject to poor outcomes
   b) Not subject to better outcomes
   c) Subject to better outcomes
   d) Not subject to poor outcomes

5. The effect of pre existing comorbidities on the clinical outcomes of the ACL injured patients who participate in EbSP WC/WH program is
   a) Very significant
   b) No effect
   c) Not significant
   d) Not sure

6. The normal duration of EbSP WC/WH program for ACL injured patients is
   a) 4 days a week with 2 hours a day
   b) 1 day a week with 5 hours a day
   c) 3 days a week with 5 hours a day
   d) 5 days a week with 5 hours a day

Answer Key for CME Questions from Disability Medicine Vol 7, #3

Questions on page 5: Primary Care Physician and Prescription Narcotics for the Treatment of Chronic Non-Malignant Pain

Questions on page 8: Medical Marijuana...an Accident Waiting to Happen

Questions on page 12: A Broader Examination of Outcomes in a Disabled Worker Population

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AMA Guides and the 2011 Amendments to the Illinois Workers’ Compensation Act

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Ellen Keefe-Garner, JD, RN, BSN, Keefe, Campbell, Biery & Associates, Chicago, IL

Last year, observers of the Illinois workers’ compensation system learned of a scandal at the Menard, IL Correctional Center in southern Illinois in which literally hundreds of prison employees were receiving significant workers’ compensation settlements. Following an investigation, it was learned the prison’s warden got a settlement in the range of $80,000, one of his lieutenants got a settlement of about $118,000 and numerous other prison workers got settlements ranging from $20,000 to as high as $150,000 and more.

At one point, it was reported over 260 employees in a prison with 550 employees had pending workers’ compensation claims. This year, the Illinois Auditor General filed a scathing report indicating taxpayers spent approximately $30 million dollars for workers’ compensation benefits over a four-year period for this single penal institution. At that rate, workers’ compensation benefits would eventually be the number one cost for the facility and would outstrip the cost of building an entirely new building within a decade or less!

Further investigation disclosed the State of Illinois claims adjuster managing the prison’s workers’ compensation claims and settlements got a significant settlement herself. It was also disclosed the Arbitrator assigned to monitor and approve the prison settlements received a settlement of about $48,000. From the perspective of all veteran claims handlers in the workers’ compensation arena, it appeared the system was completely out of control.

The questions interested observers might ask about all these workers’ compensation claims are simple because workers’ compensation is supposed to pay benefits for “accidental injuries.” With several hundred state prison workers claiming injury benefits, you might ask—is this a wildly dangerous place to work? Are prison managers, guards and staff being attacked or severely injured on a regular basis? Is the prison an antiquated, broken down and wildly dangerous place?

To the contrary, the vast majority of the claims didn’t involve what anyone in the safety industry would characterize as an “accident.” Almost all of the claims outlined above arose from what is called “repetitive or cumulative trauma.” The body parts most commonly involved were wrists, elbows and shoulders. The surgeries most commonly performed were carpal tunnel and cubital tunnel.

This “scandal” created lots of new questions and brought a renewed legislative focus on the entire Illinois workers’ compensation system. Governor Quinn also got involved and started to voice concerns about the problems with the system with media sources. In relatively short order, the Illinois legislature starting creating reforms that led to the 2011 Amendments to the Illinois Workers’ Compensation Act.

Among the changes most discussed in the 2011 Amendments to the Illinois Workers Compensation Act was the inclusion of American Medical Association Guidelines to Permanent Impairment. Prior to enactment of the new law in 2011, the Illinois workers’ comp system had followed a form of stare decisis as permanent disability was awarded based on prior similar awards for the same conditions. No metrics were ever truly employed.

Illinois law now allows for the introduction of permanent impairment ratings as evidence before the Arbitrators and Commissioners of the Illinois Workers Compensation Commission in the determination of permanency awards. The law states:
Sec. 8.1b. Determination of permanent partial disability. For accidental injuries that occur on or after September 1, 2011, permanent partial disability shall be established using the following criteria:

(a) A physician licensed to practice medicine in all of its branches preparing a permanent partial disability impairment report shall report the level of impairment in writing. The report shall include an evaluation of medically defined and professionally appropriate measurements of impairment that include, but are not limited to: loss of range of motion; loss of strength; measured atrophy of tissue mass consistent with the injury; and any other measurements that establish the nature and extent of the impairment. The most current edition of the American Medical Association's "Guides to the Evaluation of Permanent Impairment" shall be used by the physician in determining the level of impairment.

(b) In determining the level of permanent partial disability, the Commission shall base its determination on the following factors: (i) the reported level of impairment pursuant to subsection (a); (ii) the occupation of the injured employee; (iii) the age of the employee at the time of the injury; (iv) the employee's future earning capacity; and (v) evidence of disability corroborated by the treating medical records. No single enumerated factor shall be the sole determinant of disability. In determining the level of disability, the relevance and weight of any factors used in addition to the level of impairment as reported by the physician must be explained in a written order.

(Source: P.A. 97-18, eff. 6-28-11.)

Two defining features of this statute are the language which indicates accidents on or after September 1, 2011 “shall” use impairment ratings. This makes the consideration of the concept mandatory if the ratings are provided by either party.

Second, impairment ratings don’t have to be followed by themselves as a matter of law—the hearing officers must also consider other factors, such as loss of earning capacity and evidence of disability. In our view, the five factors listed in the second full paragraph provide for some subjective sway to still be present in any permanency determination by an Arbitrator or Commissioner.

The argument in favor of adopting the AMA Guidelines was based on complaints and concerns monetary awards to injured workers varied greatly. Some observers complained the awards centered on politics and not impartial factors. An initial goal was to give physicians a say in the determination of what true “permanency” might be following a serious injury. The majority of the states had already adopted the Guides. It was hoped implementation of the AMA Guidelines would bring some consistency and reproducibility to permanency awards in Illinois. We are also certain another goal was to lower permanency awards across the board.

This article analyzes the efficacy of the AMA Guidelines in the workers compensation setting. A great deal of confusion now exists as to whether an impairment rating is required to be presented or if it is up to the parties. A number of scenarios may present themselves: The employer/respondent may present an impairment rating while the injured worker/petitioner does not. Rather than a unilateral rating, both parties may present opposing ratings for a hearing officer to select. However, it is clear that at least some parties will present permanent impairment ratings. As we start to see this new concept in use, we are certain it will impact and affect the workers’ compensation system in Illinois.
HISTORY OF THE AMA GUIDES
AND THE BATTLE BETWEEN THE
5th AND 6th EDITIONS

The AMA Guidelines were the result of a project by the American Medical Association which began in 1956. They represent work by physicians and other health professionals in a number of fields including occupational medicine and multiple medical/surgical subspecialties. The project attempted to categorize virtually every medical condition which can cause permanent impairment. The methodology is meant to be uniform and provide the practitioner with both an approach to impairment analysis and the actual ratings.

The Guidelines are not limited to workers’ compensation settings—they can be used in general liability claims, like motor vehicle accidents. The AMA Guidelines have been accepted by international bodies, multiple countries and American States. While some states accept the 5th Edition, 14 use the most current 6th Edition as do Puerto Rico, the District of Columbia and the Office of Workers’ Compensation Programs when implementing the Federal Employees Compensation Act. This is an important point because the 6th Edition represented an acceptance of internationally accepted methods which are supposed to be much more rigid than the 5th Edition. In fact one of the greatest criticisms of the earlier Guides was the relative level of subjectivity. Studies have shown an error rating of up to 93% in impairment ratings using prior Editions of the AMA Guidelines.

The adoption of the 6th vs. 5th Editions of the AMA Guidelines had multiple impact, as a number of the impairment ratings for certain conditions significantly decreased. Several court challenges followed and took place in states wanting to change from the 5th to the 6th Edition. Changing editions has also led to greater confusion among physicians who can no longer “just read the book” and then conduct and rapidly provide an impairment evaluation. It is felt a knowledgeable physician without training could struggle through the 6th Edition alone, but the nomenclature may be so challenging, it is felt a specialized training course may be needed for even veterans doctors/surgeons to understand and effectively use the book.

Previously, permanency ratings in Illinois were based largely on the treating or independent medical evaluation physician's subjective perception of how much a condition or injury affected the examinee's ability to work. These values were based primarily on physician experience and clinical background.

The 6th Edition of the AMA Guidelines does eliminate a good deal of that subjectivity. This most recent version is divided into chapters on the spine, upper extremity, lower extremity, cardiovascular system, gastrointestinal system and others. Each of these chapters has tables which include both the diagnosis and its severity (for one example: moderate vs. severe osteoarthritis of the shoulder).

The final impairment rating is determined by the physician’s diagnosis and perception of severity. When creating the rating, the physician chooses a 'default level' for the diagnosis and adjusts it accordingly based on additional data (examples: range of motion, strength, history and imaging studies). The system is supposed to have a 'fail safe' concept for symptom magnification if the pain complaints do not correlate with other data. An impairment rating is given for the involved extremity or system which is then converted to a percentage of the whole person based on another table. If two or more areas are involved they are not added. Instead, another table is used to convert the numbers to a percent of the whole person. The process is designed to be arguably reproducible by whoever does the examination. Unfortunately there are problems with the Guidelines that negatively impact even routine utilization.

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If you are interested in submitting an article for consideration, please email inquires to the Acquisitions Editor, Chris E. Stout, PsyD, MBA at: chris.stout@atipt.com
PROCEDURAL PROBLEMS WITH IMPLEMENTING THE AMA GUIDES

Well-established organizations sponsor instructional courses in the 6th Edition of the AMA Guidelines including the American Academy of Orthopaedic Surgeons. However since these occur only once or twice a year, the 2011 Amendments to the Illinois Workers’ Compensation Act caused numerous professional courses to be offered to physicians in Illinois by varying educational organizations. These organizations now vigorously compete in the AMA Guides course business. Illinois physicians are enrolling and attending these courses to keep up with their brethren and this change to Illinois law. While possibly not the intent of the legislation, it has caused a thriving cottage industry in impairment evaluation which physicians feel may become profitable. An ongoing concern is how much impairment ratings will be used may have held down the number of evaluations sought by insurance carriers and provided by doctors to date. This uncertainty has not stopped physicians and surgeons from getting needed training and then presenting themselves as experts in providing impairment ratings.

One may also look at the statute cited above to note there is no particular expertise required under the law to provide an AMA impairment rating—the statute requires a licensed physician and nothing more. The courses and certifications are basically selling points for the physicians who are now offering this service. We do feel the training and certifications will help in making the concept more viable and valuable to the larger Illinois workers’ compensation system. We also feel physicians who have little or no training will not hold up well if they are deposed and asked to provide a statutory basis for their determinations.

What may be more disturbing is many of the newly qualified “experts” are either non-practicing or semi-retired physicians who may be out of touch with current medical knowledge. This can impact the evaluation because a number of such physicians may well not be familiar with the diagnostic and surgical procedures actually done on the individual presenting for an evaluation. As a simple example a physician not familiar with arthroscopic surgery might merely take the examinee’s word he/she underwent arthroscopy to clean up the rotator cuff when a complicated stabilization procedure might have been performed. The two diagnoses are completely different and the impairment ratings should be as well.

While the evaluating physician is supposed to obtain and review all medical records before performing the evaluation, many examinees have substantial records and details can be missed by even a careful reviewer. Moreover it is conceivable that not all relevant records will be available, especially if the records are more than seven years old—the standard period after which they can be shredded. Even if they are available it is plausible an orthopedic surgeon or physician could misinterpret an operative report. This scenario is concerning especially since the eventual monetary award given to an injured worker may in fact turn on the physician’s understanding of the diagnosis and the procedure performed.

IMPAIRMENT VS. DISABILITY

The AMA Guidelines are used to measure “impairment” as compared to “disability.” Impairment is defined by the Guides as: “a significant deviation, loss, loss of use, of any body structure or body function in an individual with a health condition, disorder or disease.”

Disability is defined as: “activity limitation and/or participation restriction in an individual with a health condition, disorder or disease.” The dichotomy can be seen in the following example: A physicist and a pianist both suffer amputation of the non-dominant little finger. Both have the same ratable “impairment”: 100% of the digit, 10% of the hand, 9% of the upper extremity and 5% of the whole person. In comparing the loss of the digit to the job, the physicist has no measurable “disability,” but the pianist would be unable to effectively perform and would be totally disabled from his occupation.
The case above represents the central problem with the use of the AMA Guidelines in evaluating permanency in workers’ compensation. The issues workers’ compensation system is designed to address focus on job limitations and the ability of the injured worker to make a living. Impairment is almost more of theory than practice. The employer should be responsible for compensating the injured workers’ disability and trying to minimize the impact of the disability on earning capacity through job accommodation and continuing medical treatment.

The physician is tasked with minimizing disability by assisting with job modification and possibly other medical options. The impairment rating has little if anything to do with earnings and accommodations. While a scientific value or estimate of impairment in the activities of daily living can be derived, it would be impossible to produce an evaluation as to job disability in every possible job.

As we outline above, the new Illinois statute does seem to address these issues and anomalies by requiring the hearing officer to consider five other factors in making a final permanency determination and ruling.

THE FUTURE OF IMPAIRMENT RATINGS

The search for an objective standard in evaluating permanency has led Illinois and many other states to look to the 6th Edition of the AMA Guidelines. The Illinois system also allows the hearing officers to look at several other factors in making the final determination. Based on what is happening in Illinois, we can assume physicians across the state are ready to collect substantial amounts for doing impairment evaluations. The issue remains as to whether the Illinois workers’ compensation system will improve based upon inclusion of impairment ratings.

Impairment rating fees may now be added to treatment as part of the overall “medical costs” of the Illinois workers’ compensation system. The key question is whether the costs incurred for impairment ratings will actually be of value to the system. It can be argued they have the potential to decrease employer’s rising claim costs and standardize awards. One also has to ask whether decisions based on those ratings will actually be changing a system based on disability and not impairment.

One thing we are sure of—the Illinois legislature is slow to move to change things in the workers’ compensation arena. In the last twenty-five years, there have been significant changes to the law twice. We can all expect impairment ratings to be here for some time and the industry will have to adjust to their strengths and weaknesses for years to come.
BOOK REVIEW

Current Perspectives in Clinical Treatment and Management in Workers’ Compensation Cases

by Chris E. Stout, Matt Kruger and Jeff Rogers (eds)

Reviewed by Mohammed Ranavaya MD, JD, MS

Current Perspectives in Clinical and Management in Workers’ Compensation Cases is a must-have for anyone involved in workers’ compensation and disability medicine. The 255 page book is edited by Chris E. Stout, Matt Kruger and Jeff Rogers, and it is one of the most comprehensive books on workers’ compensation available, offering a truly unique collection of diverse perspectives by clinicians, attorneys, academics and opinion leaders.

With topics ranging from “evidence-based medicine” to “closing nightmare claims,” this book offers the full depth and texture of what it is like to work with injured workers from every perspective. It points toward designing a better health care system with a focus on the economy, healthcare policy and change, and growing innovation in medical practice.

Workers’ compensation is problematic and controversial world-wide. The editors recognize the differences of opinion and this book reflects that. It is the first time such a prestigious group of people with diverse perspectives has come together in one book. The contributing authors reads like a who’s who in disability medicine and workers’ compensation and includes Richard W. Lenkov, JD, President of the National Workers’ Compensation Coalition; Joseph Paduda, author of the popular blog “Managed Care Matters;” Peter Rousmaniere, columnist for “Risk & Insurance Magazine;” former state prosecutor Robert M. Aurbach, JD and CEO of Uncommon Approach, Inc.; researchers from the Workers Compensation Research Institute, and ATI Physical Therapy and the College of Medicine at the University of Illinois at Chicago.

Everyone seems to agree that the Workers Compensation system in the U.S. is broken, but all sides argue over the reasons why. Throughout the years the perspectives incentives in a workers’ compensation case vary widely depending upon whom you are interacting with—MDs, Insurance representatives, employers, and even the patient themselves. The goal of the book is to shed some light on the different perspectives and opinions by a well-rounded group of experts within the workers’ compensation and disability medicine fields, and to provide a glimpse of how hard it can be to navigate these waters to obtain a good outcome, which all parties agree is a healthy return-to-work.

To date, there has not been one book that synthetically canvasses:

- Covers every aspect of the complexity of the workers comp patient
- Has the level of expertise that the contributing authors herein being to the topic
- Provides actionable (if not visionary) clinical approaches from various healthcare providers and other experts, not just a critique what’s wrong
- Involves an outcomes and evidence-based approach
- This book can serve a varied audience of readers who too often may be “professionally-siloed” in their own specialties to thus miss the important concomitant aspects that could inform and improve their work
One work that incorporates and integrates:
Scientific, evidence-based perspectives,
Legal aspects and precedents, and
Healthcare economics and policy.

The first half of the book offers a historical look at what has not worked for the past 60 years, examines the current state of workers’ compensation, and looks to the future. The authors tackle the question of why workers’ compensation is not reimbursed at the same rate as group insurance and delve into the ethical challenges of working with workers’ compensation patients.

Additional chapter topics include methods for applying evidence-based medicine to workers’ compensation cases and a discussion of various co-morbidities or pre-existing health conditions that may negatively impact injured workers’ abilities to gain appropriate rehabilitative milestones. The book also includes results from a new, online survey that is a bit unique in its scope and design that canvassed all providers involved in workers’ compensation cases. The survey’s anonymity fostered very frank responses, many of which are very eye opening.

The invited specialty chapters include an examination of how the adversarial process of dispute resolution in workers’ compensation claims creates significant costs and delays for all parties; strategies to close the proverbial “nightmare claim”; and a discussion on persistent problems in clinical practice. Additional topics include performance-based payments, advances in laser therapy for the treatment of work-related injuries, and a study by the Workers Compensation Research Institute that focuses on how medical practice patterns vary for low back conditions.

Based on the current climate with a focus on the economy, healthcare policy and change, and growing innovation in practice, the import of such a book as proposed herein is critical. Today, in addition to growing legal precedents and regulatory concerns, there is a promising benefit of the application of evidence-based approaches to disability medicine and workers’ compensation practices. (For example, evidence shows that many clinicians treating injured workers do not follow official or medical society endorsed medical treatment guidelines. These improved outcomes include: less risky treatments, faster healing, and good return to work experience.) Other chapters expose the unnecessary inflation of claims costs through the indirect costs of lawyer involvement, and pinpoint critical issues for system design and points the way, through specific working examples, to the possibility of a better system.

This book covers and integrates all aspects of care. In doing so, this book is unique in the field, and should serve as a significantly important reference tool to the tens of thousands of professionals that work with this population as well as students and trainees. Claims professionals, lawyers, policy makers, state legislators, workers’ compensation regulators in state agencies, workers’ compensation insurers and large employers, physical therapists, chiropractors, physicians, rehab specialists, occupational health professionals, anyone involved in outpatient rehabilitation or workers compensation treatment—Athletic Trainers Occupational Therapists, Physiologists, nurses, insurance professionals, psychologists, utilization reviewers—all would benefit from reading this work.

The editors represent ATI and all royalties from this book will go to the ATI Foundation devoted to funding healthcare for needy children. The book is published by Bentham Science Publishers Ltd. and is available online at http://tinyurl.com/ATIWCBook.
As the Journal continues to grow and add new and beneficial recurring sections, we are pleased to announce the advent of “Research Digest.” The busy practitioner generally finds him/herself not having the time to keep up with the literature. This new section of the Journal seeks to remedy this by providing succinct updates from relevant and recently published peer review articles of interest or our readership. We will make selections from various journals for each issue in order to provide as much breadth and exposure as possible. We hope you find this new enhancement to be of benefit to your work. Chris E. Stout, PsyD

1. Comorbidities Double Workers’ Compensation Claims

While the average medical cost for a workers compensation claim is approximately $6,000, the medical cost of an individual claim can be a few hundred dollars or millions of dollars. In 2010, an NCCI study found that claims with an obesity comorbidity diagnosis incurred significantly higher medical costs than comparable claims without such a comorbidity diagnosis. Relative to that study, this study expands the number of comorbidities examined and provides additional information on both the types of claimants receiving comorbidity diagnoses and the types of providers submitting comorbidity diagnoses.

Key Findings
- The share of workers compensation claims with a comorbidity diagnosis nearly tripled from Accident Year 2000 to Accident Year 2009, growing from a share of 2.4% to 6.6%
- Claims with a comorbidity diagnosis have about twice the medical costs of otherwise comparable claims
- Comorbidity diagnoses for hypertension are the most prevalent of those investigated
- The initial comorbidity diagnosis tends to occur early in the life of a claim
- Hospital and physician visits account for a majority of visits resulting in a recorded comorbidity diagnosis
- Only a small portion of visits result in the recording of a comorbidity diagnosis
- 81% of claims with diagnoses of obesity incurred lost time.


2. Exercise and Weight Gain

Abstract
Context: Data supporting physical activity guidelines to prevent long-term weight gain are sparse, particularly during the period when the highest risk of weight gain occurs.

Objective: To evaluate the relationship between habitual activity levels and changes in body mass index (BMI) and waist circumference over 20 years.

Design, Setting, and Participants: The Coronary Artery Risk Development in Young Adults (CARDIA) study is a prospective longitudinal study with 20 years of follow-up, 1985-1986 to 2005-2006. Habitual activity was defined as maintaining high, moderate, and low activity levels based on sex-specific tertiles
of activity scores at baseline. Participants comprised a population-based multicenter cohort (Chicago, Illinois; Birmingham, Alabama; Minneapolis, Minnesota; and Oakland, California) of 3554 men and women aged 18 to 30 years at baseline.

**Main Outcome Measures:** Average annual changes in BMI and waist circumference.

**Results:** Over 20 years, maintaining high levels of activity was associated with smaller gains in BMI and waist circumference compared with low activity levels after adjustment for race, baseline BMI, age, education, cigarette smoking status, alcohol use, and energy intake. Men maintaining high activity gained 2.6 fewer kilograms (+0.15 BMI units per year; 95% confidence interval [CI], 0.11-0.18 vs +0.20 in the lower activity group; 95% CI, 0.17-0.23), and women maintaining higher activity gained 6.1 fewer kilograms (+0.17 BMI units per year; 95% CI, 0.12-0.21 vs +0.30 in the lower activity group; 95% CI, 0.25-0.34). Men maintaining high activity gained 3.1 fewer centimeters in waist circumference (+0.52 cm per year; 95% CI, 0.43-0.61 cm vs 0.67 cm in the lower activity group; 95% CI, 0.60-0.75 cm) and women maintaining higher activity gained 3.8 fewer centimeters (+0.49 cm per year; 95% CI, 0.39-0.58 cm vs 0.67 cm in the lower activity group; 95% CI, 0.60-0.75 cm).

**Conclusion:** Maintaining high activity levels through young adulthood may lessen weight gain as young adults transition to middle age, particularly in women.


### 3. Physicians With More Experience = Lower Costs

**Abstract**

Health plans and Medicare are using cost profiles to identify which physicians account for more health care spending than others. By identifying the costliest physicians, health plans and Medicare hope to craft policy interventions to reduce total health care spending. To identify which physician types, if any, might be costlier than others, we analyzed cost profiles created from health plan claims for physicians in Massachusetts. We found that physicians with fewer than ten years of experience had 13.2 percent higher overall costs than physicians with forty or more years of experience. We found no association between costs and other physician characteristics, such as having had malpractice claims or disciplinary actions, board certification status, and the size of the group in which the physician practices. Although winners and losers are inevitable in any cost-profiling effort, physicians with less experience are more likely to be negatively affected by policies that use cost profiles, unless they change their practice patterns. For example, these physicians could be excluded from high-value networks or receive lower payments under Medicare’s planned value-based payment program. We cannot fully explain the mechanism by which more-experienced physicians have lower costs, but our results suggest that the more costly practice style of newly trained physicians may be a driver of rising health care costs overall.


A substantial body of evidence from the group health sector indicates that there is a strong relationship between physician experience, measured by the volume of care provided, and the outcome of that care. This study explores the association between the experience level of the providers who treat and manage California’s injured workers and their outcomes as measured by claim cost (medical and indemnity) and other factors.


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