WYOMING WORKERS' SAFETY & COMPENSATION DIVISION

Pilot Program for Spinal Injury Treatment

Optimal Outcomes with Cost Containment
for
Spine Services

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Wyoming Workers Safety and Compensation Division directs the process which determines how a patient receives medical care for injuries sustained at work. This is a weighty responsibility since the initial direction or lack thereof, ultimately determines not only how the money is spent, but more importantly whether the injured worker re-enters the workforce or becomes a passive recipient of state funds for continued health care, and potentially food, clothing, and shelter. This may sound like an exaggeration, but with thoughtful assessment of the details within this report, we are hopeful you will recognize the seismic impact that several small changes can potentially make for the workers and workers families of Wyoming.

Executive Summary

The Optimal Outcomes with Cost Containment for Spine Services (OOCCSS) pilot program was designed to address two primary objectives for Wyoming Workers Safety and Compensation Division. The objectives were to 1) improve outcomes and 2) detour the trend towards unsustainable spending on spine injuries which occur on the work site. The first task was to clearly establish potential primary contributing problem areas which would negatively impact outcomes. For this reason, we requested outcomes data from previous years in order to establish patterns. Additionally, in an attempt to evaluate the efficacy of treatment, a comparison of surrounding and nonadjacent states was utilized for return to work scores. Finally, we accumulated metrics from claimants in two counties, targeted as areas of over utilization, from a pilot program which gathered data over eight consecutive months in 2011. Based on adherence and lack of adherence to a set of evidence based clinical guidelines, we were able to compare and contrast outcomes and utilization for this population.

The information we acquired presents compelling evidence to support continuing the quest towards the original two previously stated objectives of improving outcomes and containing costs. Although the numbers strongly suggest certain patterns, statistical significance is lacking. For this reason, caution should be used during interpretations. We are hopeful that in reading the materials more questions will be raised. With thoughtful contemplation, attempts can be made to establish a clear focus on areas most likely to have the largest impact on these injured workers. Our goal would be that this problem-solving approach would continue with diligent future efforts towards meetings Wyoming Workers Safety and Compensation Division's objectives.

Section 1

National Prevalence, Cost, Outcomes and Trends Associated with Evaluating and Treating Spine Injuries and Complaints of Acute Neck and Back Pain in the Workplace

How often does someone have back or neck pain? What are the societal costs of low back pain in America? What are the differences in treating new onset pain of spinal origin compared with treatment of a chronic nature? In providing answers to these questions we will demonstrate the need to support the efforts of Wyoming Workers Safety and Compensation Division in requesting the development of a system which would begin to contain costs and improve outcomes for the injured workers in the state of Wyoming. Does current clinical management follow evidence-based guidelines? If we chose to adjust or implement such guidelines would this change in practice patterns be helpful? Following an introduction into the magnitude of the problem presented in the request for a proposal, this topic will be presented and discussed.

Essentially, there has been no change in the pathology or the prevalence associated with the new onset of low back and neck pain for quite some time, although some will argue with an increase in a sedentary population there has been an increase in frequency. We do know that there has been a significant increase in spending for the evaluation and treatment of these conditions and that there appears to be trend towards an increase in days lost from work? In reviewing the more recent literature and following practice trends in the United States a significant adherence to evidence-based guidelines since the publication of the Agency for Health Care Policy and Research (AHCPR) for low back pain in 1994 has not been shown. Unfortunately, despite the evidence of a constant flow of patients with these back and neck injuries and complaints of pain, and despite profound increases in expenditures, the outcomes have either remained stable or worsened.

Even though the numbers of effected in the population has increased and there has been a significant increase in available types of treatment for spine injury and pain made available, patients have not been reporting significant improvements in their functional levels or a decrease in their pain intensity ratings. This is despite a profound increase in utilization of most medical and health fields.

From 1997 to 2005, (in only eight years), Americans' spending on neck and spine examinations and treatments increased by 65%. An incredible 220% rise in the rate of spinal fusions was reported from 1990 to 2001. Additionally, from 1994 to 2001, a 271% increase in steroidal spine injections was reported. Medication use for pain of spinal

origin has also increased with a trend to use the more expensive, “designer” medications. There has also been a significant increase in use of opioids for spine pain which is not related to cancer.

None of the above increases have any correlation to patients’ improved health, function, return to work status, or decrease in report of pain severity.

Section 2

Evaluation and Treatment of Work-Related Spine Injuries and Pain in Wyoming

Based on limited, but current data, it appears that Wyoming is following the same course as that seen nationally when it comes to spending on treatment for back pain and back injury as a result of a job-related incident. The vocations seen to have the highest rates of injury include physical laborers, and health care professionals.

Compared to some states, Wyoming provides easier access to providers since there are no designated workers compensation providers and no requirements which would prevent a patient from choosing or switching providers at any time during their care. Additionally, patients can independently choose between an emergency department, an urgent care clinic, a primary care office, chiropractor, or seek a surgeon for their initial treatment after the injury occurs. Injured workers can also freely choose which hospital or surgical center and pharmacy and physical therapy facilitation they want to utilize.
Injured workers receive lifetime medical services for injuries sustained while working in Wyoming. There appears to be limited incentive to be placed at maximal medical improvement. Many claimants receive total and partial disability payments for extended periods of time without any withholdings for taxes. They also have unlimited freedoms to seek additional medical opinions with minimum involvement from the program.

Unfortunately, despite increases in utilization of diagnostics, treatments of multiple types including physical therapy, chiropractic manipulations, medications including opioids, injections, and surgeries, the outcomes have worsened. This pattern is identical to those nationally, which the exception that the surgical rates per capita surpass those of the national average. Outcomes noted to be lower than expected in Wyoming include return to work rates. Nationally, higher pain intensity reports, increased rates of mental illnesses such as anxiety, depression, and substance abuse are reported, but are not compared to those in Wyoming.

As if that wasn't enough bad news, it also appears that this decrease in return to work equates in significantly increased dependency of the now unemployed worker on the state for Medicaid, food and housing subsidies. Instead of paying into taxes, this population of patients with neck and back pain is now relying on the state and federal government programs for their medical care as well as continuing to receive long-term monies from the workers compensation program.

Section 3

Multistate Comparison of Evaluation and Treatment Outcomes for Workers Compensation Injuries Including Wyoming, Montana, Colorado, Oklahoma, Texas, and Virginia

Having worked with spine injuries and spine pain for over 25 years first as a physical therapist and a then as a physician, I can compare and contrast patterns of treatment which directly and indirectly impacts outcomes as it relates to spine injury and pain incurred on the job.

Across the board, these factors have been seen to improve the likelihood of patient compliance with treatment recommendations.

1. Establish contact immediately with a health care provider that understands how the workers compensation system works who will communicate directly with each party involved. This includes the entities paying for the services, the clinicians who are providing the services, and with the injured workers and their family members.
2. Set in motion shared documentation between the providers and payers to clarify the timing and nature of the injury, determine causation, and provide consistency in diagnosis and treatment plan. All documentation is to be made available to the patient.
3. Address the workers medical and financial concerns, (as it relates to time off work, return to previous vocation, etc.) in a direct and timely manner.
4. At any time, there is an unexpected delay in the recovery process, act in a timely fashion to address all potential contributors for such delay with the patient, aggressively pursue cause with appropriate treatment adjustments.
5. In cases of delayed recovery, implement a multidisciplinary approach to evaluation and further treatment.
6. Implement education along with open communications from the date of injury to return to work and full recovery.

In order to look closer at the systems at Wyoming Workers Safety and Compensation Division a multistate comparison is provided. (Refer to Appendix A)

Section 4

Factors Unique to Wyoming Impacting Work-Related Injury Treatment Patterns, Costs, and Outcomes of Injuries Sustained in the Workplace

WWSCD is one of the few states remaining that carried workers benefits through a state funded mandatory program for which employers pay all costs through premiums to cover an injured worker and to afford them protection against the injured worker seeking legal action regarding their injury. There are many factors which are unique to Wyoming and this state's ability to provide for its injured worker.

Consider the workforce in Wyoming. Compared to many states, Wyoming has a higher percentage of workers in the field of energy. There are also various other forms of physical laborers here which have a higher propensity to spine injury than more sedentary types of work. In addition to the physical demands of these types of jobs are the combined effects of Wyoming's climate. These workers are out in the elements, (unbearable cold, ferocious wind and various forms of moisture), many times in physically precarious positions. Maneuvering heavy equipment on difficult and unpredictable terrain is common. Employees are exposed to extreme weather conditions on a regular basis in order to do their jobs on rigs, ranches and coal mines. The health care industry is another area where workers display a higher incidence of back and neck injuries. This has been attributed to the physical demands of the services they provide such as lifting and moving of patients, prolonged periods of standing with frequent bending, lifting and twisting, and working long shifts. These two groups alone make up a large group of workers in the state of Wyoming who report spine injuries.

Another factor contributing to the unique nature of spine injury and treatment in Wyoming is the limited number of health care providers who have received special training in work-related injuries. The number of injured workers exceeds the number of health care providers to treat them. Currently there are five outpatient physiatrists in the state, only one medication management fellowship trained pain physician, one or two medical psychologists who are experienced in dealing with the complex nature of injured workers. As of the writing of this report, there are no board certified occupational medicine physicians in the state of Wyoming. Interestingly, in keeping with our literature review of trends and utilizations, there is an abundance of providers who offer procedural approaches to diagnosis and treatment of spine injuries and resultant pain. These specialists include those who provide injections, physical therapy, and surgery.

Currently there is not a system in place at WWSCD for educating and certifying providers in the state of Wyoming that are trained and well versed in the WWSCD requirements, paperwork, terminology, and expectations, or aspirations for treating the injured worker.

Much of the work in Wyoming occurs in rural settings. In this state with the sparse nature of its' population, the distance from work site to health care facility can be a barrier to the injured worker adding to time from injury to receipt of health care services. These extra minutes and sometimes hours to being evaluated by a provider who understands not only the medical condition, but also how the workers' compensation system works can contribute not only to the physical or structural changes incurred at the time of the injury, but also to the psychological concerns of the worker, such as fear and anxiety.

WWSCD provides a medical and facilitative role between the employer, who pays for the plan and its services to care for their injured employees, and the injured worker whom is receiving the services.

a. Program costs and support for coverage of the injured worker are incurred 100% by the employers. The premiums that are paid to the state funded program cover; medical costs (doctors' visits, physical therapy, radiology needs, procedures, surgical intervention), time off benefits to the worker's, as well as any legal fees that may incur if the injured worker chooses to sue regarding any denials of coverage from the state. As these costs go up it is transferred to the employers as an increase to their annual premium payments.
b. Unlike other states WWSCD does not have apportionment for the care they provide, therefore, if an injured worker is to strain their back and it is found they have another issue related, then WWSCD still incurs all costs.
c. The check and balance system for WWSCD currently in place has medical and indemnity of every case as well as actuaries that are completed annually to ensure that there is financial stability within the program to cover the costs of the WWSCD claimants as well as the staff at WWSCD.

Section 5

Introduction into Wyoming Workers' Compensation & Safety Divisions' Pilot Program Optimal Outcomes with Cost Containment for Spine Services

Back pain is a highly prevalent affliction, and is singly the most common cause of chronic pain. Eighty percent of the population will suffer with back pain at some point in life. Additionally, low back pain ranks fifth on the list of the most common reasons people visit their physician (Andersson, 1999). An estimated 25 to 50 billion dollars are spent annually on evaluating and treating this debilitating condition. Indirect costs are also substantial, with an estimated 2% of the workers in the United States compensated for work lost each year (Deyo, 2006).

Back and neck problems are some of the most commonly encountered issues in clinical practice and are also among the most costly. A survey of adults in the United States had 26% of respondents indicating that they had low back pain and 14% reporting neck pain in the prior three months (Deyo, 2006). Spine pain alone accounted from nearly 3% of all office visits to a physician (Gray, 2006). With such an increasingly large volume, the question arises: Does such an increase produce a corresponding increase in associated medical costs? Additionally, with an increase in volume of spine pain and the resulting therapeutic procedures, are outcomes improving, remaining the same or worsening? Similar to discussions of the national debt and the deficit, the impact of back pain and injury in the United States is so great that it is impossible to conceptualize the consequences. After all, how many of us can write down the number $383 billion – the interest due on the US 2009 debt, or $1.4 trillion – the national deficit for 2009 (Clames, 2009)? How many average Americans know the difference in the debt and the deficit? Probably more citizens have a greater familiarity with these economic terms than they do with a common medical condition which not only directly impacts their livelihood, including their daily earnings, but also their outgoing expenditures including their insurance premiums, and can forecast their future employment and all potential earnings.

The prevalence and incidence of back pain is so high that we no longer ask <u>if</u> you have ever had back pain. We ask <u>when</u> and <u>how long ago</u> did you have back pain? The societal impact of persistent back and neck pain may be hidden from some, but the costs of lost time from work and inability to return to a previous job or to transition to a new vocation has economic implications that are felt more acutely and have a much broader reach now than ever before in the history of America. Today in the current recession, getting hurt on the job for some <u>is</u> their retirement plan. Never before have we had 3 living generations of injured workers who will not receive another paycheck, but will live out the rest of their lives on federal and/or state subsidies as a direct result of a back or neck injury sustained at work which <u>did</u> <u>not</u> result in spinal cord or nerve injury, fracture,

deformity, or other physical or neurologic damage other than pain. Interestingly, just like distinguishing debt from deficit in the novice mind, the ability to distinguish from injury and pain also seem to lack clarity. The need to clarify causation from correlation when we determine claims and risk metrics in work-related injuries of the spine leads to further complicate the terminology. Who is responsible for paying for these services and how deep are the states pockets?

In addition to moving towards improved precision in verbiage we hope to present compelling facts which support the efforts of Wyoming Workers Safety and Compensation Division in addressing concerns such as how the injured workers respond to the current treatment methodology and how to use the currently available and projected future financial resources.

Section 6

Specific Aims of Optimal Outcomes with Cost Containment for Spine Services; Making Sure the Injured Worker is More Than a Data Point

6.1 - Introduction

The purpose of this pilot project was to examine an alternative to the current methods of practice utilized for evaluating and treating work-related injuries to the spine within the Wyoming Workers Safety and Compensation System. Most clinical trials examine patient outcomes for a minimum of three years. Since OOCCSS's timeline for patient enrollment was less than eight months, our main aim was to provide an assessment of the feasibility of implementing a uniform system from the date of injury to the date an injured worker returns to work which would be specifically designed to improve the evaluation and treatment process by using a structured approach which would follow readily accepted, evidence-based guidelines. Education to the employers, providers, case analysts, and patients would be provided in a format, which would exactly parallel the tracking process in order to map compliance, utilization, and subsequently outcomes. OOCCSS proposed a multidisciplinary approach, utilization of easy-to-follow treatment algorithms and active participation of the claimants. The emphasis of the project was ongoing education to all parties (payers, providers, employers, and injured workers), a treatment approach which implements a biopsychosocial model, and focus on functional restoration, de-emphasizing the injured workers identity as a passive recipient of tests and procedures, (including surgery), as a pathway or detour to returning to work.

6.2 – Bio-psychosocial Model

As the name implies, the bio-psychosocial model is a conceptual approach to understanding both pain and injury where biological, psychological (*e.g.* thoughts, emotions, and behaviors) and social factors all play a significant role in the human experience of injury and the subsequent improvement. For example, it is known that an individual's psychological factors (e.g. depression) as well as their beliefs about pain play an important role in how they experience spinal pain and their return to work outcome (Pincus, 2006).

Identifying the theory behind how one believes healing and improvement will occur is important as it guides the approach to treatment. In other words, in order to understand the rational for the proposed clinical care guidelines of spinal injuries, it is important to know the theoretical basis for these recommendations.

What are other psychological facts that can influence outcomes to spinal injuries? Does a second opinion office visit with a surgeon or receiving an MRI prior to the six-week post

injury date influence an injured worker's outcome? Recent research has shown that these things can have negative influence on claimant by promoting the transition in identity from "a worker who sustained an injury" to the label of "injured worker."

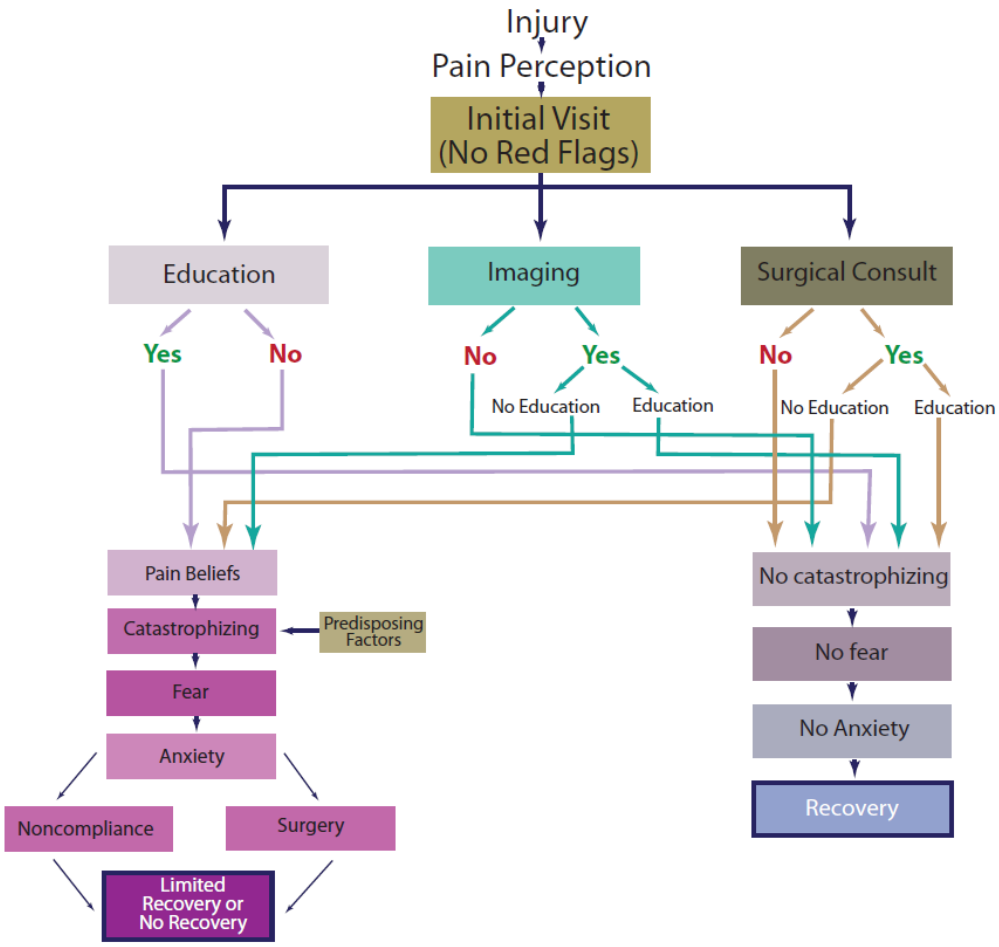
In one retrospective study on 3264 cases of LBP with Workmans' Compensation claims, claimants came off of disability 200% slower (134 days vs. 23 days) when they received an MRI within the first 30 days after injury versus those not receiving an MRI (Webster, 2010). Alarmingly, claimants in the MRI group had surgery rates of around 80%, while those in the non-MRI group had a surgery rate of less than 10%. To bypass arguments that claimants who received MRIs had worse injuries, researchers identified factors that increased the likelihood of receiving an early MRI and then divided those receiving MRIs into two groups called: "high propensity and low propensity" groups. After, statistically adjusting for factors such as age, the researchers illustrated that the MRI is itself an independent risk factor for poor outcomes.

6.3 - Catastrophizing Hypothesis Model & Education

Again, the biopsychosocial (BPS) model is one potential explanation for why we see early MRIs negatively impacting outcomes such as return to work. Another theory related to BPS is the Catastrophizing Hypothesis Model (Pincus, 2006), which we have modified for the purposes of this pilot program and call the Modified Catastrophizing Hypothesis Model or MCHM. This model takes the BPS model and specifies or details a psychological mechanism through the patient catastrophizing, which is defined as an irrational thought whereby one believes that something is far worse than it actually is.

As illustrated in **Figure 6.1**, people's predisposing factors and their beliefs about pain prior to injury are both factors that play into the MCHM model. Incorrect or faulty education received by the patient can further negatively impact prior beliefs and predisposing factors. Providing accurate and appropriate education to patients about spinal injury and pain can reduce or eliminate results of prior beliefs and predisposing, which in turn is likely to improve the chances of faster recovery. Similarly, imaging received that does not adhere to a standard of practice that follows evidence base guidelines can inflame a person's negative pain beliefs and lead to catastrophizing. Imaging coupled with timely, accurate education can be beneficial. The disparity in these two approaches leads to ethical questions that are currently under debate in the field today.

Figure 6.1 Modified Catastrophizing Hypothesis Model



6.4 - Evidence-based Clinical Care Guidelines

With the ambitious aim of examining the feasibility and efficacy of clinical care guidelines for treatment of work related spinal injuries, the question may arise as to why they are necessary. The answer to "Why clinical practice guidelines?" lies in both the current culture of treatment for work related spinal injuries in Wyoming, as well as the national trend to move away from consensus-driven treatment approaches that are based on clinical evidence. Consensus-driven treatment approaches depend more on group opinion versus actual data on outcomes. An example of a consensus-driven approach is a particular surgical style that a surgeon practices because that was the method their mentor used during their residency. This is opposed to data-driven or evidence based care guidelines, which uses regional and national outcomes data determine the best practices of care.

To our knowledge, there are no standards in Wyoming for timing or association of ordering diagnostic imaging for work related spine injuries. The same holds true for physical therapy and psychological counseling. Guidelines for care provide physicians with a blueprint for how to maximize a patient's chances of recovery. Guidelines are based on years of scientific outcomes literature, which points to best practices of caring for specific illnesses and injuries. In this pilot project, the Family Medicine Clinical Care Guidelines for spinal injury were adopted since it was predicted that primary care providers would initially see the majority of these injured workers. Far from a "one-size-fits-all" approach, these guidelines build in the understanding that many injuries that are seen in the clinical setting will fit into a specific care model, while allowing flexibility for the need for more unique care scenarios in some cases.

Overall, this pilot study's aim was to implement a set of spine injury treatment guidelines and then assess the response from both providers and patients. Additionally, with the guidelines in place, another aim of the study was to begin determining how implementation of these guidelines may improve medical outcomes.

Section 7

Methods of Optimal Outcomes with Cost Containment for Spine Services

7.1 - Study Design

The pilot program was designed to enroll 100 participants who were Wyoming Workers Safety and Compensation claimants who sustained a work-related spine injury to assess the effectiveness and feasibility of a proposed change in evaluation and treatment methodology. Primary care physicians or physician extenders were to evaluate and implement a treatment plan for the first six weeks following the injury, discontinuing care when the claimant returned to work full time without restrictions and was without medical complaint. If the claimant did not meet these criteria, he or she was to be referred to a non-surgical spine specialist for further assessment.

7.2 - Institutional Review Board

Prior to the commencement of the project, approval to carry out the project was received by the Wyoming Department of Health's Institutional Review Board in Cheyenne. This board provided a detailed informed consenting procedure to be carried out on each of the program participants.

7.3 - Participant & Clinician Recruitment and Education

In order to recruit and educate participants for the pilot program from primary care and urgent care clinics as well as emergency departments, Dr. Nelson and the OOCCSS staff met with physicians, physician extenders, chiropractors, physical therapist, and ancillary support members on multiple occasions in attempt to reach a maximum number of different predicted entry locations for participant enrollment. (Refer to Appendix B for detailed list). The evidence to support the implementation of the American Family Practice Guidelines was introduced. The details of the guidelines including treatment algorithms, tracking sheets, enrollment papers, and educational materials were provided. Additionally, an explanation of the incentives for the employers, employees, and participating providers was given. Further promotion of the efforts of Wyoming Workers Safety and Compensation Division as revealed by the support of OOCCSS was presented by Dr. K. Nelson to Wyoming Medical Center Hospital Board of Directors and to the largest diagnostic and interventional radiology group in Natrona and Converse Counties, Casper Medical Imaging. In an effort to educate and recruit support from employers in the state of Wyoming, Mr. Mark Smith and Ms. Stacey Ziedler met with Wyoming Medical Center human resources personnel and Ms. Ziedler gave a formal presentation to

Wyoming Oil and Gas Industry Safety Alliance, (WOGISA). Positive response received from the WOGISA included a request from an OSHA representative that OOCCSS be presented at the next OSHA meeting in Casper, a request from a gentleman from Houston, Texas requesting a copy of the presentation for his corporate office, and a request from WOGISA to place the presentation on the WOGOSA website. Additional targets set for education included Converse County Commissioners, Converse and Natrona County Nursing Homes, and the City of Casper.

7.4 - Inclusion Criteria

Patients included into the study were required to be between the ages of 18-70. Participants needed to have filed a new Workers' Compensation claim for a neck or back injury that was activated by the Workers' Compensation analyst.

An informed consent form was read and signed by each participant in order to ensure that they understood the research procedure. Participants were allowed to ask any questions that they had about the project, and copies of the form were provided to individuals who requested them. Additionally, a HIPPA consent form was signed by participants in order to allow for the release of their medical records. Data was collected from each participant in the form of the Oswestry Disability Index, a lumbar or cervical questionnaire, and a back or neck injury template form.

7.5 - Oswestry Disability Index

The Oswestry Disability Index is a tool designed to assist clinicians and researchers as well as disability evaluators to assess a patient's functional level (Refer to Appendix F). The test questionnaire has been used for 31 years (Fairbank, 1980) and is considered by some to be the "gold standard" of low back functional outcome tools (Fairbank, 2000). Two other questionnaires utilized in OOCCSS were back and neck questionnaires, which were created by Dr. Nelson to provide specific information regarding the participant's symptoms to allow tracking for monitoring responses to the recommended treatment. Lastly, lumbar and cervical injury templates were given to participants upon their initial visit. These standardized forms capture a variety of physiological data on the participants and provides information to the clinician as to whether or not imaging should be considered based on the presence of absence of red flags.

7.6 - Incentives & Compliance

Upon completion of this form, participants were given the financial incentive of $100 for signing up, to be followed by an additional $250 for those who were compliant with the

guidelines.* Additionally, providers seen on the initial visits were given a $500 incentive for each participant they enrolled into the pilot program with the understanding that the providers would follow the guidelines.

Participants were compliant to the procedure outlined in this pilot study if they went to their healthcare provider at least every two weeks for the first six weeks after injury. Participants could go to their healthcare provider more frequently than every two weeks, and if the healthcare provider released the patient to return to work with full duty without restriction, the participant did not need to return to the clinic. In addition to attending the regular scheduled check-ups, the participant had to follow the treatment recommendations such as physical therapy, in order to be compliant. Those participants who continued to report symptoms and had not returned to work full time without restriction by the six-week follow-up visit were scheduled to see a non-surgical spine specialist and were required to fill out the Örebro Musculoskeletal Pain Questionnaire (ÖMPQ). Responses on the OMPQ were interpreted to assist with determination of need for referral to cognitive behavioral therapist and or psychologist.

7.7 - Örebro Musculoskeletal Pain Questionnaire (ÖMPQ)

The ÖMPQ is a self-administered tool that assesses long-term disability and failure to return to work. It is designed to be completed four to twelve weeks following an injury. It is highly predictive of those who will recover (95%) and for those who will have no further sick leave over the next six months (81%), and those who will fail to return to work (86%). The rationale in using the ÖMPQ is that, identifying workers who may not return to work provides the treating healthcare provider the opportunity to select an intervention that can reduce the risk of long-term disability. In other words, if personal and environmental factors place a person at an increased risk for delay in recovery these can be identified and addressed. (Refer to Appendix C).

7.8 - Administrative Support Processes

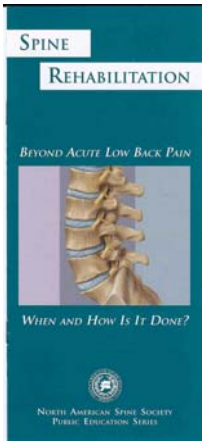
Upon enrollment of a participant to the pilot study, a fax was sent to the case analyst at the Workers' Compensation office detailing their name, date of injury, and employer in order to enroll them as a participant. A detailed flow chart from injury to program completion is available. (Refer to Appendix D). Additionally, an invoice was generated in order for the physician and participant incentive to be distributed.

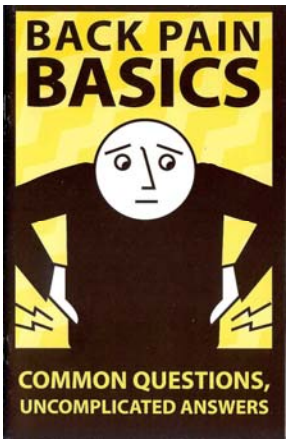
* Note: A financial incentive to participants who signed on after August 1, 2011, with only 13 participants who enrolled prior to this date.

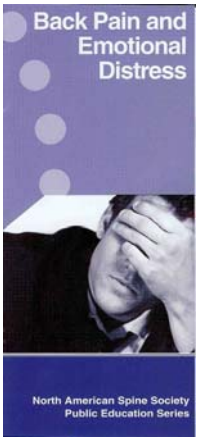
7.9 - Education: Pamphlets, Website, Videos

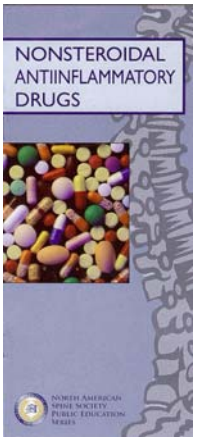
One of the key components of this pilot program was education. An emphasis was made on providing consistent information to Wyoming Workers Safety and Compensation Division personnel, employers, providers, patients and patient's family members. The design of the program included components of active and passive learning as well as cross-over education regarding not only repeat exposure to information, but also paired teaching. Trained clinicians, savvy to current literature reviews and evidence based clinical practices were to include in a portion of the visits with the patients one-on-one question and answer educational time. This time was allocated into the follow-up visit and for this reason; more time for the visit was to be scheduled. These visits were to be immediately preceded by the patient spending time on interactive computer-based teaching modules on www.swarminteractive.com via a web site or made available on DVD's with a designated private computer workstation located in the front office area of Pain Associates of Wyoming and Wyoming Brain and Spine Associates. (Refer to Appendix E for details on educational topics selected). Upon initial enrollment the claimants were provided four pamphlets: 1) *Spine Rehabilitation: Beyond Acute Low Back Pain*, 2) *Back Pain and Emotional Distress*, 3)*Nonsteroidal Anti-inflammatory Drugs*, and one booklet entitled *Back Pain Basics*. (Examples are below) The first pamphlet discusses the differences in acute, sub-acute and chronic care and uses analogy to help explain the differences between the two. The second pamphlet addresses and validates the psychological components involved in pain. The pamphlet on NSAIDS was chosen as an introduction to this medication, which could be a strategic tool in their treatment regimen. Lastly the booklet answers many common questions patients have when dealing with spine pain. All four educational materials were published by the North American Spine Society.

Educational Material Covers









Section 8

Results of Optimal Outcomes with Cost Containment for Spine Services

8.1 - Participant Characteristics

The demographic and summary information for the 32 participants enrolled over an eight-month period between March and October 2011, is seen in Table 1. Participants had a mean age of 35.5 years ranging from 20 to 57 with a median age of 33.5 years. Nearly twice as many men (21) enrolled into the study as females (11). Sixty-nine percent of enrollees indicated that they currently use tobacco, and twenty-five percent reported current use of alcohol. Six (19%) of the enrollees to the study had previous injuries in the effected area. Whether or not any of these six re-injuries were work-related is unknown at the time of this report. The regions of the spine reported included 10% combination of cervical and lumbar spine, 15% cervical, and 75% lumbar spine.

Table 8.1 Participant Demographics

Variable	N (%)	Mean (SD)
Age	-	35.5 (10.9)
Female	11 (35%)	-
Previous injury	6 (19%)	-
Comb of C and L injury	10%	-
Cervical injury	15%	-
Lumbar injury	75%	-
Occupation:		-
Oil Rig Hand	7 (22%)	-
Nursing Assistant	6 (19%)	-
City Worker	3 (9%)	-
Tobacco use, current	22 (69%)	-
Alcohol use, current	8 (25%)	-

8.2 - Compliance

One central aim of the study was to examine the feasibility and potential efficacy of implementing evidence based guidelines. In order to accomplish this, it was necessary to establish whether or not participants adhered to care guidelines. Those who adhered to the guidelines we refer to as “compliant” and those who did not follow the guidelines are referred to as “noncompliant. Among the 32 claimants enrolled into the study, exactly half were noncompliant in following the care guidelines outlined to them upon enrollment. Noncompliance was further split into whether it was the patient or the provider who chose to veer from the recommended methods. Of the 16 noncompliant cases, eight were due to the physician diverging from the care guidelines, one was due to the patient not returning to care, one was due to the participant changing care providers

and five were a combination of both the physician and the patient not following the guidelines at different times during the care.

Fourteen (44%) of enrollees received imaging in the form of x-rays, CTs or MRIs within the first six weeks, with half of all the enrollees receiving them on the initial visit. Nine of the images were X-rays and six were MRIs or CT scans. Of the 14 that received images, only three followed the care guidelines. Overall, participants had an average of just under three providers over the course of their care and ranged from one to nine providers with the noncompliant group having a mean of 3.6 providers, and the compliant group having a mean of 1.5 providers, reflecting a 50% increase in providers for the noncompliant group.

8.3 - Pain Intensity and Function

A self-reported pain intensity (Visual Analogue Score referred to as VAS) as well as the Oswestry Disability Index, which measures function, were obtained at the initial visit. Participants had a mean VAS of 6 with a standard deviation of 2 and a range from 3 to10. The mean for the Oswestry total score was 20 with a standard deviation of 10.3, which was calculated using the 25 participants who completed each of the Oswestry questions. Distributions for item responses for the Oswestry Disability Index are presented in Appendix F.

8.4 - Return to Work

Among the outcomes tracked in the project was return to work data. As seen in **Table 8.2**, 23 (72%) of the study participants returned to work before six weeks from the date of injury, of those 23 returning to work within the first 6 weeks of injury, 15 (65%) were compliant to the care guidelines and 8 (35%) were not. At the writing of this report, five of the participants are still not back to work, and have transitioned, by definition, from acute to chronic pain conditions. Of those who enrolled into the study who were compliant to the guidelines, 14 of the 16 (88%) returned to work within the first six weeks. For those noncompliant, eight of 16 (50%) returned to work within the first six weeks.

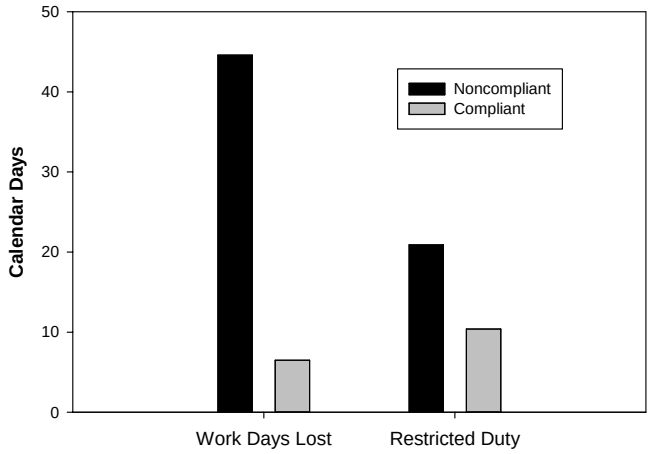
Table 8.2 Clinical Outcomes

Variable	N (%)	Mean (SD)
Work Days Lost	-	26 (52)
Days light duty	-	16 (22)
VAS at initial visit	-	6 (2)
Oswestry	-	20 (10)
Compliant to guidelines	16 (50%)	-
RTW first 6 weeks	23 (72%)	-
Imaging first 6 weeks	14 (44%)	-
Surgeries[†]	None	-

Overall, enrollees had a mean number days of lost work of approximately 26 days (SD = 52) and a range of 0 to 218 days lost, with a mean number of days on light duty of 16 (SD = 22) and a range of 0 to 84 days. As seen in **Figure 8.1**, when separated out by compliance, those who were not compliant to the care guidelines had nearly seven times more work days lost. Those who were compliant to the guidelines had, on average, 6.5 days of work lost while those who were not compliant missed on average 44.6 days.

When examining the relationship between days lost from work and pain intensity score, there was a weak positive correlation (p = 0.058) found when doing a Pearson product moment correlation. This means that people who presented with higher VAS scores upon initial visit generally returned to work slower.

Figure 8.1 Work Days Lost and Restricted Duty Comparison: Compliant Study Participants vs. Noncompliant



The noncompliant group spent over twice the number of days on restricted duty (10 days vs. 21 days) than those who were compliant, as **Figure 8.1** also illustrates. Days were

[†] Based on available information received from WWSCD we are unable to compare the number of spine surgeries performed on injured workers within the same period as the OOCCSS program within Converse and Natrona counties.

calculated by using calendar days, since most participants had vocations that would include weekend work schedules. In reviewing treatment plans, one of the participants was seen by a psychologist and two participants went to physical therapy (Refer to Table 8.3). Three participants received injections and one received lumbar medial branch thermal denervation, (rhizotomies). Less than 15% of the participants were prescribed opioids. **None of the participants received surgery**.

Table 8.3 Utilization of Medical Services

	MRI	CT	X-Ray	Injections	PT	Opioids	Flexeril
Participants	3	4	11	3	4	2	16

8.5 - Direct Costs

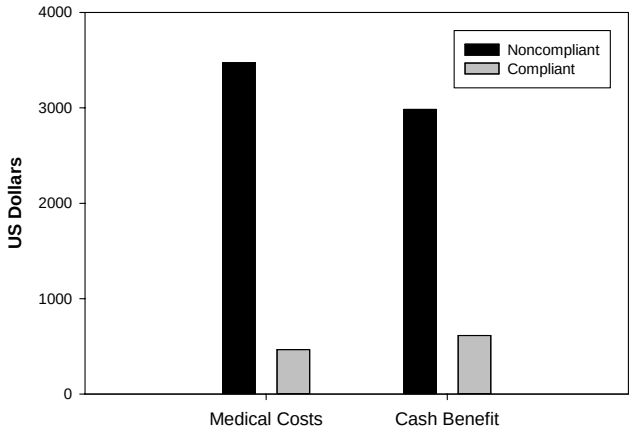
Outcomes were also tracked by the Wyoming Workers' Safety and Compensation Division in the form of both dollar costs of medical treatment, and dollar costs of indemnification or cash benefit to the injured worker. Twelve participants received temporary total disability (TTD). Four of those receiving TTD were compliant and eight noncompliant. As tabulated in **Table 8.4**, costs totaled were an average of $3,779.00 per participant with a near even split between medical and compensation costs. **Table 8.4** further separates out this costing between the compliant and noncompliant groups.

Table 8.4 Medical and Compensation Costs for Study Participants

	Compliant Mean (Std Dev)	Noncompliant Mean (Std Dev)	All Participants Mean (Std Dev)
Medical	$488 ($1,022)	$3,474 ($4,137)	$1,981 ($3,339)
Indemnity	$613 ($1,795)	$2,983 ($4,070)	$1,798 ($3,320)
Total	$1,100 ($2,808)	$6,547 ($7,639)	$3,779 ($6,281)

Medical costs for noncompliant, on average, were nearly eight times more than the compliant group, as illustrated in **Figure 8.2**. Additionally, the noncompliant group received nearly five times more compensation than the compliant group. Another way to say this is that the noncompliant group comprised 88% of the medical costs and 83% of the benefit costs. Taking this further, the most expensive four individuals (12.5%) who did not comply with the guidelines accounted for 63% of the medical costs and 53% of the compensation costs.

Figure 8.2. Medical Cost and Cash Benefit Comparison: Compliant Study Participants vs. Noncompliant

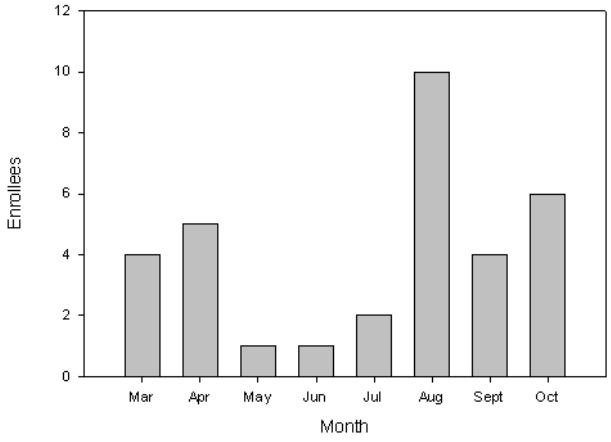


8.6 - Feasibility

Another aim of the study was assessing the feasibility of implementing a set of spine injury treatment guidelines for WWSCD claimants in Wyoming. Primary care, emergency department clinicians and other healthcare providers were recruited for participation in the pilot program through a presentation given by Dr. Karen Nelson to provider groups. Seven provider groups were visited, totaling approximately 20 clinicians (physicians, nurse practitioners or physicians' assistants, physical therapists) and one provider group was visited in Douglas totaling eight clinicians. Of these, only three provider groups comprising three physicians and two nurse practitioners chose to participate in the pilot program. One physician refused to participate because the guidelines would change her practicing routine. A second physician did not participate due to his strategy of ordering imaging on the initial visit to limit his liability. The clinical group in Douglas, which was visited twice, was most vocally resistant to participating.

Thirty-two participants enrolled into the pilot project, which was just under one third of the goal number of 100 enrollees. As seen in **Figure 8.3**, enrollment was highest in the month of August. This month coincided with the commencement of a $350 incentive to participants.

Figure 8.3 Histogram of Claimants Enrolled into the Study per Month



Section 9

Discussion of Optimal Outcomes with Cost Containment for Spine Services

9.1 - OOCCSS Comparison to WWSCD Data 2008-10

One viable question is: How does our sample of 32 compare to data from spine claimants from other years? To answer this question, we first looked at the demographics of our sample and comparing them to the demographics in the spine claimants in Natrona and Converse counties from 2008-2010.

The percentage of females with work related spine injuries ranged from 43.1% in 2008 to 53.9% in 2010 in Natrona & Converse counties, as seen in the retrospective data summary found in Appendix G. This compares to a 35% female rate for this pilot project. Additionally, ages ranged from 38.6 to 40.7 year of age in the historic data versus 35.5 years of age in the project sample. Both age and gender ranges for the OOCCSS sample fell within comparable ranges we could expect for this population.

Expenditures were significantly less, on average, for the claimants in the project sample versus the historic data. The mean medical expense ranged from nearly $11,000 to nearly $16,000 per claimant for the 2008-2010 historic data in comparison to an average of approximately $2000 per claimant. The historic data for 2008-2010 were adjusted so that only the ICD-9 codes utilized for the OOCCSS sample were included when calculating costing. This is in part due to our project not capturing claimants only 8 months of the year from March to October. Understandably, claimants in January and February have the opportunity to have significantly higher medical expenses over the course of the year. Even by taking this shortened period into account, the differential in the medical costs between the OOCCSS pilot project participants and the 2008-2010 claimant averages seems to be significant.

9.2 - Study Weaknesses

While these cost comparisons are interesting observationally, one shortcoming of this pilot project is the inability to make any definitive conclusions about the possible benefit of the clinical care guidelines on claimant outcomes. This is due several reasons including the small sample size. In order to have a representative sample of the population of WWSCD spine claimants in Converse and Natrona County, the size of the sample needed to be 300 in order to have a 95% confidence interval, assuming that there are around 1350 spine claimants in the two counties over the course of a three year study

(450 per year). Additionally, these 300 needed to be randomly selected from the population of the 1350 claimants. Without the option to random select the sample, an error known as self-selection bias can jeopardize the ability to draw conclusions from the results.

The small sample size of the OOCCSS study can be attributed to two main issues. The first issue is the lack of provider "buy-in" into the pilot study. While we had three provider groups who faithfully referred participants into the program, most providers were not interested in participating despite being offered an incentive to participate of $500 per enrollee. One reason for the lack of provider "buy-in" could be that the benefit of receiving the $500 incentive was not worth the various cost(s) to participate. Indeed, if this is true, a higher incentive for the providers needs to be considered for any future phase of this project.

Another reason for the small sample size of the OOCCSS study is due to the lack of participant incentive. From the commencement of the project in March through the fifth month of the project in July, no incentive was offered to the claimant to enroll into the OOCCSS study. August 1, 2011 began the financial incentive offer to claimants with a low back injury if they signed up for the study and agreed to adhere to the care guidelines outlined to them. The fact that the enrollment doubled from 11 to 22 in that month, as seen in **Figure 8.3** speaks to the power of incentives in boosting enrollment in clinical trials. Moving forward with the project, the participant incentive will be key in order to obtaining a proper sample size.

9.3 - Efficient Return to Work Strategies

One important observation made in the OOCCSS program was the significant difference in return to work rates between those who were compliant to the care guidelines and those who were not. As seen in **Figure 8.1** in the Results section, the noncompliant group returned to work seven times slower than those following the guidelines.

In a recent qualitative study carried out involving 9 focus groups and 59 stakeholders to examine the psychosocial factors which influence return to work of low back pain patients (Soklaridis, 2010), one of the central conclusions of the study was that RTW is not just a factor of the individual's psychosocial factors, but rather is best understood as function of the influence of multiple systems. The health care system and the compensation system both influence a patient's RTW. When these two systems communicate properly and work together under a specific care guideline policy, the injured worker receives a maximal benefit and has the best outcomes.

While a seven times fast RTW rate is compelling, more research is needed to determine whether it is attributed to the participants adhering to the guidelines.

9.4 - Utilization

The results of the OOCCSS study showed both issues of over utilization and under utilization. Despite the guidelines, diagnostic images were given on 11 participants unnecessarily. This is significant due to diagnostic imaging, such as MRI, being an independent risk factor for poor outcomes (Webster, 2010).

Additionally, we were surprised in determining the under utilization of physical therapy. Only three of the enrollees were prescribed PT during the course of our study, which is less than 10%. Opioids were also prescribed in only two of our participants. This is significant due to the ability of opioids to aid patients in managing their acute pain and extending the window of transition from acute to chronic pain.

9.5 - Medical Ethics and Profit

A genesis of this pilot program was the Dartmouth Atlas report of 2005 Medicare data which investigated the geographical trends in spine surgery rates and had Casper, Wyoming as having the highest rate in the nation (Weinstein, 2006). One explanation for this high rate which was proposed by Hadler is the density of spine surgeons and their style of practice or willingness to perform surgery, as opposed to the patient's preference or quality of clinical presentation (Hadler: 84, 2009). If true, this explanation for the Medicare population, *e.g.* more surgeons and more willingness to cut, would also be applicable for other populations, such as injured workers.

But a high density of surgeons is only part of the possible explanation. In her *New York Times* essay entitled: "The Spine as a Profit Center," Reed Abelson discusses how the spine-fusion surgery is among the most profitable in medicine, with a single screw costing up to $1000 (Abelson, 2007). Another study examined the increase in spinal fusions of physician-owned specialty clinics in Oklahoma using Workman's Compensation claims data and found a fifty-fold increase (Mitchell, 2007).

On the other side of the issue are scientific studies by well respected investigators that call for a moratorium on laminecteomy/discectomy with or without fusion for regional low back pain due to the lack of surgical benefit versus no surgery with rehabilitation (Fairbank, 2005), (Deyo, 2004), (Koes, 2005), (Carragee 2006), (Deyo 2007).

Overall, with the lines blurred between patient-care on one side and entrepreneurship on the other, there is a need now more than ever for a common way to approach clinical care that is rooted in evidence from clinical outcomes data.

9.6 – Surgical Rates

Surgical rates for claimants with spine injuries in 2011 were not available to the time of this report. As detailed in Appendix G, however, surgical rates throughout the state as well as in Natrona and Converse counties for 2008-2010 were high. In fact, surgical rates were higher in the Workers' Compensation claimants than in Medicare enrollees reported in the Dartmouth Atlas report of 2005. See Appendix G for more details.

9.7 - Wyoming's Uniqueness & Guideline Adoption

While there is a clear case for the importance of the adoption of a standard set of clinical guidelines for spinal care of injured workers, we do not view any set of national guidelines, such as the Family Practice Care Guidelines, to be ideally suited for every state. Wyoming is relatively unique among the states in its type of work: it has the distinction of having among the highest worker death rates in the nation due to prevalence of workers in to the oil and gas industries. Combined with that, Wyoming has among the lowest emergency care physician and primary care physician rates per square mile of any state given the low state population. These two facts alone illustrate the challenges Wyoming faces as it looks to adopt guidelines. Nevertheless, having some standards of care from which clinicians can be guided is vital in order to improve patient return to work rates, decrease medical costs and change the medical culture of over utilization that currently exists within the state.

Review of the literature points out that there are predictable and identifiable barriers to adherence for implementation of clinical guidelines. The first step to successfully changing physician practice patterns would be to identify the existence, variety, and strength of barriers currently present within Wyoming health care providers, patients, and payers. Barriers to consider include lack of familiarity or awareness of the guidelines themselves, lack of agreement based on interpretation of the evidence, or lack of agreement based on applicability to a specific patient population. Some clinicians believe that all guidelines are oversimplified or are too "cookbook", lacking flexibility or that using them reduces autonomy and would produce a lack of credibility to the patients, perhaps depersonalizing the physician-patient relationship. Another barrier is that physicians may feel that guidelines are not practical, that they are inconvenient, difficult or cumbersome to use, are ineffective or that using them does not effect outcomes at all and they are therefore a waste of time and effort. One substantial hurdle to overcome is inertia to previous practice styles, perhaps even those with mal-aligned incentives. Moving away from a comfort in practice styles is extremely difficult for established

providers. One cannot underestimate the resistance to guidelines from the patients, patient's families, and in many instances, the employers. Another consideration for implementation of guidelines is time and cost related to educating and training the staff and consultative support.

Lastly, Wyoming's unique characteristics also illustrate the need for relational database of Workers' Compensation claimants that is easily accessible, cost efficient and user friendly. With this database, stake holders can begin to piece together a data-driven, outcomes based understanding of best practices for work related spine injuries.

Section 10

Utilization of Evidence Based Guidelines in Clinical Medicine: Paradigm for Improving Outcomes While Reducing Costs

Medical guidelines have several names being referred to as clinical guidelines, clinical protocols, and clinical practice guidelines. Clinical guidelines are defined by the Institute of Medicine as: “systematically developed statements to assist practitioners and patient decisions about appropriate health care for specific circumstances" (Lohr 1990:38). The aim of these documents is to establish criteria and to guide decisions regarding diagnosis, management, and treatment within specific areas of healthcare. They help to both improve patient care and steer health policy. They define the most important questions related to clinical practice and identify all possible decision options and their outcomes. Some contain decision or computation algorithms to be followed. The decision points and respective courses of action to the clinical judgment and experience of the practitioners are identified and integrated. Many guidelines place the treatment alternatives into classes to help providers in deciding which treatment to use.

Improving the quality of health care represents distinctly different connotations depending on the point of view of the participants. Patients, doctors, payers, and managers are all likely to recognize the value of implementing a system which would encourage consistency in care while promoting improved health outcomes. However, establishing specific measures for outcomes and defining quality across disciplines proves to be more of a challenge. As health care systems in the United States and around the world continue to change, we would like to assume all parties involved have the same goal at the top of their priorities: to offer the patient best care possible.

The most important and basic needs in our health care services occur when we are facing our own injury or a loved one’s illness. We trust that the health care professionals have the knowledge and the skill sets necessary to provide the correct medical treatment and that they are willing and prepared to administer it. Patients accept the information they have available. Clinical guidelines are designed to promote interventions that have proven benefit and discourage ineffective ones. By improving the consistency of care across regions, patients are more likely to receive the same type of care regardless of where or who is administering it. Many of the guidelines provide accompanying literature which is written in laymen’s terminology. Having these types of materials assists patients in making informed medical decisions, promoting discussions with their providers by providing a common reference point.

Evidence based clinical guidelines are potentially beneficial to healthcare professionals by improving consistency of care, and by providing authoritative recommendations that can offer reassurance to practitioners about the appropriateness of their treatments plans. By reviewing the evidence and acting accordingly, clinicians reinforce their role in supporting science and validating the importance and methods of critical thinking. In reviewing the evidence to support or dispute a clinical practice, physicians will be made aware of the gaps in the medical literature and can then choose to devote time to addressing these voids in the evidence by working collaboratively with medical researchers.

Historically, clinical guidelines fall under two camps: consensus-driven guidelines and evidence based guidelines. As the name implies, consensus-driven clinical guidelines are developed by experts in the field who determine the most appropriate methods for patient care. Evidence based clinical guidelines are data-driven in that they utilize outcomes information to determine the best practices for patient care. Modern clinical guidelines are a blend of the two. Evidence based practices are adopted when the analysis of outcomes data provides a clear path. But when the data is not clear, experts do the best job possible in coming to a consensus to determine best practices. So modern clinical guidelines summarize the highest quality evidence and most current data regarding diagnosis, prognosis, therapies including medications, risk benefit ratios and cost-effectiveness.

These guidelines are typically developed by medical associations or governmental bodies at the state, national, and international levels. Local healthcare providers can choose to produce their own guidelines or to adapt those from existing entities.
In December 1989 under Public Law 101-239, the Agency for Health Care Policy and Research (AHCPR) was established to enhance the quality, appropriateness, and effectiveness of health care services and access to these services (Omnibus Budget Reconciliation Act, 1989). Within AHCPR is the Office of the Forum for Quality and Effectiveness in Health Care, (the Forum), whose primary responsibility is to facilitate the development, periodic review, and to update clinical practice guidelines. These guidelines are designed to assist practitioners in the prevention, diagnosis, treatment, and management of clinical conditions. Guidelines are available in formats suitable for health care practitioners, the scientific community, educators, and consumers.
The USA and other countries maintain medical guidelines clearinghouses. In the USA, the National Guideline Clearinghouse maintains a catalog of high-quality guidelines published by various organizations (NGC, 2011). The United Kingdom, Netherlands, Germany, and the USA are members of the Guidelines International Network, (G-I-N), and international network of organizations and individuals involved in clinical practice guideline (G-I-N, 2011). The International Guideline Library is the largest web based data base of medical guidelines worldwide.

Medical guidelines usually include summarized consensus statements of best practice. Although healthcare providers are obliged to know the medical guidelines of his or her profession, adherence to the guidelines recommendations is typically voluntary and determined on an individual basis. Despite the fact that one of the objectives of clinical guidelines is to standardize medical care, unless there is a large enough volume of clinicians who choose to follow the recommendations, other objectives such as raising the quality of care, reducing risks, and achieving an optimal balance between cost and medical parameters such as effectiveness, specificity, sensitivity, resolve and as well as others will not be achieved.

One such example where guidelines have been available but not embraced are the AHCPR Clinical Practice Guidelines, No. 14, Acute Low Back Problems in Adults (Bigos,1994). The four principle reasons acute low back pain was selected for the subject of guideline development are 1) prevalence, 2) cost, 3) inappropriate care with marked regional variation in use of diagnostic tests, hospitalization and surgery, and 4) abundance and ever-growing body of available research to evaluate and from which to draw conclusions regarding efficacy and safety or assessment and treatment methods. As we review the literature on low back pain today, it is apparent that despite the evidence to strongly support the development of guidelines, there is an ever-growing need to follow them.

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Appendix A

Multi-State Workers' Compensation Comparison

Workers' Compensation studies typically are focused on five measures: health care costs, utilization, and patient satisfaction with care, access to care, and return to work. This report summarizes findings from both national and state-level Workers' Compensation information. The main national-level data came from the National Academy of Social Insurance (NASI) from 2006 to its latest report on 2009 (Sengupta *et. al.*, 2011). Additionally, state-level reports were obtained on Wyoming, Colorado, Virginia, Oklahoma, Montana and Texas (Kail *et. al*., 2005), (Schaneman, 2011), (Virginia, 2010), (Texas, 2009), (Davis, 2010). These states were selected given both their geographical and cultural diversity to compare with Wyoming. Colorado's most recent publication was from 2005, and Colorado and Oklahoma do not publish medical cost information in their reports.

NASI Overview

In 2009, the State of Wyoming spent $136,515,000 in benefits for Workmans' Compensation, which was a 17.1% increase from 2006 as seen in **Table 1**. Of these benefits, $69,525,000 were medical benefits, with the remaining $66,990,000 in cash benefits. Wyoming is one of five states that has exclusive state fund for Workers' Compensation, with Wyoming 98.7% of employers participating. Also, Wyoming is one of two states that will not allow self-insurance.[*] The largest decline in compensation benefits for 2009 was Virginia, which had a decrease of 21.5%. One reason for this, in addition to the high unemployment seen nationwide, could be due to Virginia's large increase in compensation benefits from 2006 to 2008 of 37.5%.

Table 1. Workers' Compensation Benefits by State (thousands)

	2006 ($)	2007 ($)	2008 ($)	2009 ($)	Change 08-09
Wyoming	117,322	126,994	137,133	136,515	-0.5%
National	55,117,823	55,997,632	58,104,190	58,326,816	0.2%
Colorado	903,947	878,774	916,801	884,044	-3.6%
Oklahoma	675,113	700,341	772,191	824,855	2.6%
Texas	1,419,823	1,425,946	1,538,972	1,595,358	3.7%
Virginia	808,701	1,070,668	1,112,354	873,483	21.5%
Montana	234,259	242,872	253,477	254,118	8.5%

To understand the magnitude of the coverage by state, **Table 2** provides information on the number of covered workers and **Table 3** provides information on the amount of wages covered by Workers' Compensation for each of the five states.

Nationally, workers covered by state workers' compensation dropped 5.8 million (4.4%) in 2009, as seen in **Table 2**. This was the largest decrease in covered workers in twenty years. Additionally, at the national level, employer costs for benefits fell $73.9 billion

[*] This is not 100% due to policies sold to employers that provide multi-state coverage.

(7.6%) which corresponds with the rise in the unemployment rate. Interestingly, benefits nominally increased (0.4%) in 2009 due to benefits paid to injured workers from previous years.

Table 2. Workers Covered by Workers' Compensation (Thousands)

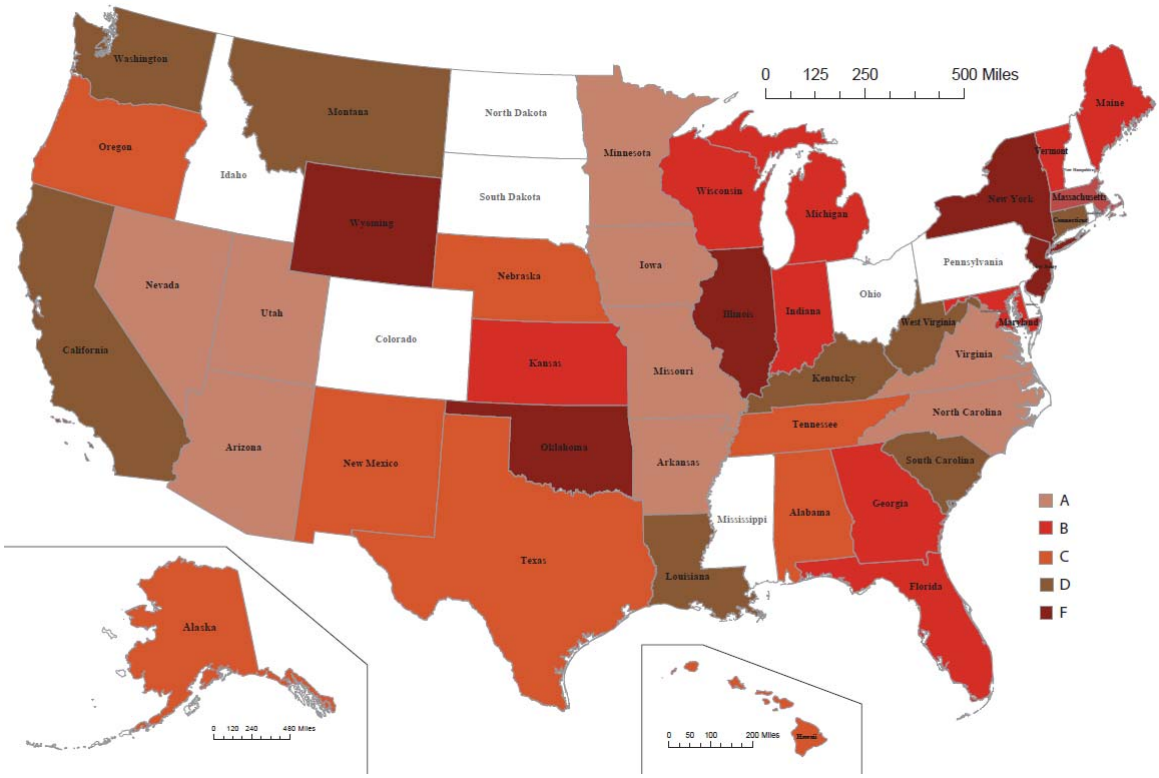
	2006	2007	2008	2009
Wyoming	260	270	279	267
National	130,339	131,734	130,643	124,856
Colorado	2,190	2,214	2,247	2,137
Oklahoma	1,461	1,489	1,499	1,379
Texas	7,498	7,636	7,651	7,818
Virginia	3,401	3,437	3,418	3,290
Montana	413	423	424	407

Using a proprietary grading scale developed by the Work Loss Data Institute, Wyoming is one of five states that have a "F" in its return to work outcomes, as seen in **Figure 1** (Work Loss Data Institute, 2011). In fact, the WLDI scored both Wyoming and Oklahoma with "F's" for return to work each year from 2000-2007, with 2007 being the latest year available.

Table 3 Workers Wages Covered by Workers' Compensation Wages

	Covered Wages (millions of dollars)			
	2006 ($)	2007 ($)	2008 ($)	2009($)
Wyoming	9,400	10,499	11,461	10,746
National	5,374,520	5,680,035	5,954,327	5,675,466
Colorado	93,534	99,900	103,687	99,105
Oklahoma	48,671	51,750	54,861	52,617
Texas	315,913	338,828	349,132	336,402
Virginia	145,707	153,522	156,661	153,518
Montana	12,304	13,303	13,792	13,415

Figure 1: US Map of Work Loss Institute Grades by State, 2007 (Work Loss Inst, 2011)



Annual within State Comparison

One way that NASI standardized the state benefit payments is to divide the state's Workman's Compensation dollar benefits by total wages of covered workers, as seen in **Table 4**. This metric accounts for the number of workers and state wage levels, and can show whether or not a fluctuation in a particular year's benefits program is due to a corresponding change in the population of total covered workers or not. While this measure is useful in looking at changes in a specific state over time, it is not helpful in comparing changes in benefits across different states.

Table 4 Workers' Compensation Covered Wages / Covered Workers by State

	RTW Score	2006 ($)	2007 ($)	2008 ($)	2009($)	Change 06-09
Wyoming	F	36.15	38.89	41.08	40.24	11.3%
National	NA	41.23	43.11	44.18	45.45	10.2%
Colorado	NA	42.71	45.12	46.14	45.67	6.5%
Oklahoma	F	33.31	34.75	36.60	38.16	14.6%
Texas	C	42.13	44.37	45.63	43.03	2.1%
Virginia	A	42.84	44.67	45.83	46.66	8.2%
Montana	D	29.79	31.45	32.53	32.96	10.6%

State-Level Data

As seen in **Table 5**, Wyoming was the only state in the NASI report where a decrease in benefits was seen from 2007-2008 relative to covered payroll despite there being an increase in total dollars of benefits increasing in the state (NASI, 2010). Between 2007 and 2008, the total benefits increased 8.0 percent, but the benefits per $100 of covered wages decreased by 1.0 percent. Given the uncertainty of the reason for this decrease, a plausible explanation for it could be due to a decrease in the benefits spent or to wages increasing. A decrease in benefits could be due to fewer injuries, less utilization per injury or a quicker return to work period for injured workers.

Table 5 Workers' Compensation Benefits per $100 of Covered Wages, 2006-2008

	2006 ($)	2007 ($)	2008 ($)	2009 ($)	Change 07-09
Wyoming	1.25	1.21	1.20	1.27	0.05
Colorado	0.92	0.84	0.84	0.89	0.06
Oklahoma	1.39	1.36	1.43	1.57	0.15
Texas	0.44	0.42	0.43	0.47	0.12
Virginia	0.55	0.70	0.73	0.57	-0.19
Montana	1.83	1.84	1.84	1.89	.06

Table 6 provides another perspective in comparing Workers' Compensation outcomes on a state-level. The Work Loss Institute Grades from 2007 have been placed next to the ratio of total Workers' Compensation benefits and state-level GDP for 2007, as well as the ratio of covered wages and covered workers from the same year. Total state Workers' Compensation benefits were divided by state-level GDP as an attempt to provide a normalizing factor with which to make comparisons.

In setting these metrics in the same table, several clear trends are seen. First, having a high cash benefit-to-GDP ratio seems to have an adverse effect on return to work. The three states with the lowest return to work scores, Montana, Wyoming and Oklahoma, had the highest cash benefits-to-GDP ratio of the six states examined. Indeed, when assessing the correlation of RTW and ratio of cash-benefits to GDP among the 41 states with report card scores, a highly statistically significant ($p = 0.21$) negative correlation was seen, using the Pearson product-moment correlation. This can be translated to mean RTW scores get lower as the cash-benefits to GDP ratio gets higher. Intuitively, this is reasonable in that if Workers' Compensation claimants stay off work longer, they receive more cash benefits. One hypothesis for this correlation is that the cash benefit provides an incentive for the claimant *not* to return to work. This scenario is likely seen in Wyoming, where the claimant's Workers' Compensation benefit can, in some cases, provide more income than if they returned to work.

Another trend seen in **Table 6** is that the low ratio of medical-to-cash benefits yields a low return to work score. Correlating the RTW scores of 41 states with their respective medical-to-cash benefit ratio also produced a highly statistically significant ($p = 0.21$) positive correlation. In other words, the more states pay for medical treatments and/or the less they pay for cash benefits, the better the return the work outcome. It should be noted that having correlation does not prove that there is a causal relationship; *i.e.*, high cash benefits to claimants does not necessarily cause poor RTW outcomes.

Table 6 2007 State-level Comparison

	State RTW Report Card	Med. Benefits to GDP ratio (Rank)	Cash Benefits to GDP ratio (Rank)	Medical-to-Cash Benefits ratio	Covered Wages/ Covered Workers (Rank)
Wyoming	F	2.0 (4)	2.0 (4)	1.0 (4)	38.9 (4)
National	NA	1.8 (-)	1.9 (-)	1.0	43.1 (-)
Colorado	NA	1.7 (3)	1.9 (3)	0.9 (5)	45.1 (1)
Oklahoma	F	3.1 (5)	3.1 (6)	0.75 (6)	34.8 (5)
Texas	C	0.8 (1)	0.5 (1)	1.6 (1)	44.4 (3)
Virginia	A	1.6 (2)	1.2 (2)	1.4 (2)	44.7 (2)
Montana	D	4.0 (6)	3.0 (5)	1.3 (3)	31.45 (6)

Table 7 is an attempt to summarize back claims information from several of the state workers' compensation annual reports (note: this does not include neck claims). The table shows that Wyoming medical cost for new back claimants were 45% higher for the first year than Texas (WHIN, 2011 & Texas, 2010). Only Texas and Wyoming had medical costs reported for new back claimants. The $3,100 per claimant for Texas was for costs incurred 12 months post-injury, while the $5,687 per claimant medical in Wyoming was just costs incurred in 2009. The Wyoming number is significantly higher since it accounts for claimants with one month medical expenses all the way up to twelve months of expenses.

Lastly, the table shows that medical costs for open back claimants (the combination of new and old claimants) were 46% higher in Wyoming than in Virginia for 2009. For Virginia, the 1,580 claimants were labeled as "Files with Medical Payments" and included rehabilitation, hospital expenses, doctor's expenses and other medical expenses. For Colorado, the data are from final pay notices received in 2009 for medical expenses for settled claims. These were 42% higher in Wyoming than in Colorado.

Table 7 State-level Workers' Compensation Back Claimant Statistics 2009

	Total Claimants (New/Open)	Back Claimants (New)	Medical Costs (New Back)	Back Claimants (Open)	Medical Costs (Open Back)
Wyoming	11,944	2,256 (18.9%)	$5,687	4,227	$31,507
Colorado	29,229	4,664 (16%)	--	--	$18,134*
Oklahoma	15,838	3,305 (20.9%)	--	--	--
Texas	--	--	$3,100	--	--
Virginia	11,435/13,278	--	--	1,580	$16,889

*This is the conservative proxy measure for open back claims medical costs.

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Virginia Worker's Compensation Commission. (2010). *Statistical Report for the Calendar Year of 2009.*

Workers' Compensation Research & Evaluation Group. (2009). *Impacts of the 2007 Adoption of ODG-TWC Treatment Guidelines on Medical Utilization and Costs: A preliminary report.* Texas Department of Insurance.

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Appendix B: Participant and Clinician Recruitment and Education

Natrona County:

1. Western Medical Associates-East and West Side Clinics
   6500 E 2nd Street Suite 200
   Casper, Wyoming 82609 (307) 577-5100
2. Sage Medical Group
   419 S. Washington Street Suite 200
   Casper, Wyoming 82601 (307) 265-8300
   a. Dr. David Erk
   b. Dr. Jason Lloyd
   c. Dr. Darrell Willis
   d. Dr. Andrew Avery
   e. Dr. Dexter Casta
   f. Dr. Anca Voinov
3. Rocky Mountain Medical Associates
   2241 Farnum Street Suite 102
   Casper, Wyoming 82609 (307) 315-6133
   a. Dr. Eric Lawrence
   b. Dr. Jason Strand
4. Urgent Care Now-East Side Clinic
   2546 E 2nd Street
   Casper, Wyoming 82609 (307) 265-1110
5. Instacare Of Casper
   900 Cy Ave.
   Casper, Wyoming 82601 (307) 237-2273
6. Wyoming Medical Center-Emergency Room Physicians
   1233 E 2nd Street
   Casper, Wyoming 82601 (307) 577-7201
7. Dr. Marc Delgadillo, D.C.
   2121 E 2nd Street Suite 103
   Casper, Wyoming 82609 (307) 266-2225
8. Dr. Daniel Staight, D.C.
   223 S Kenwood
   Casper, Wyoming 82601 (307) 237-7898
9. Dr. Scott Dean Popp-Popp Chiropractic & Rehabilitation
   300 Landmark Lane
   Casper, Wyoming 82609 (307) 237-6669
10. Outpatient Radiology Department
    419 S. Washington Street Suite 101
    Casper, Wyoming 82601 (307) 265-1620
11. Dr. David Wheeler-Wyoming Neurologic Associates
    1020 E 2nd Street Suite 100
    Casper, Wyoming 82601 (307) 265-4343

12. Representation From The Following Physical Therapy Groups:

a. North Platte Physical Therapy
311 Thelma Dr.
Casper, Wyoming 82609 (307) 234-2662

b. Therapy Solutions
6631 E. 2nd Street
Casper, Wyoming 82609 (307) 268-9904

c. Rocky Mountain Therapy
2546 E. 2nd Street Building 500
Casper, Wyoming 82609 (307) 577-5204

d. Central Wyoming Therapy
201 E. 2nd Street Suite 12
Casper, Wyoming 82601 (307) 472-3327

13. Casper Orthopaedics Sports, Spine, Bones, Joints & Trauma
4140 Centennial Hills Blvd., Suite A
Casper, Wyoming 82609 (307) 265-7205

Converse County:

1. Converse County Memorial Hospital-Emergency Room Physicians
111 S. 5th Street
Douglas, Wyoming 82633 (307) 358-2122
2. Memorial Hospital of Converse County Knisely Center
111 S 5th Street 4th Floor Knisely Center
Douglas, Wyoming 82633
   a. Dr. Rex Wortham- Suite #5 (307) 358-7373
   b. Dr. Deeanne Engle- Suite #5 (307) 358-7373
   c. Kelly Clausen, FNP- Suite #1 (307) 358-7380
   d. Dr. Lori Tobler- Suite #1 (307) 358-7380
   e. Dr. James Morgan-Suite #2 (307) 358-1458
3. Dr. Robert Keeler, D.C.
1843 Madora Ave.
Douglas, Wyoming 82633 (307) 358-4418

Appendix C

Örebro Musculoskeletal Pain Questionnaire (ÖMPQ)

The ÖMPQ is a self-administered tool that assesses long-term disability and failure to return to work. It is designed to be completed four to twelve weeks following an injury. It is highly predictive of those who will recover (95%) and for those who will have no further sick leave over the next six months (81%), and those who will fail to return to work (86%). The rationale in using the ÖMPQ is that, identifying workers who may not return to work provides the treating healthcare provider the opportunity to select an intervention that can reduce the risk of long-term disability. In other words, if personal and environmental factors place a person at an increased risk for delay in recovery these can be identified and addressed.

1. Name_____ Phone _____Date _____

2. Date of Injury _____ Date of Birth _____

3. Male or Female? M or F

4. Were you born in Australia? Y or N

These questions and statements apply if you have aches or pains, such as back, shoulder, or neck pain. Please read and answer questions carefully. Do not take long to answer the questions, however, it is Important that you answer every questions. There is **always** a response for your particular situation.

5. Where do you have pain? Please X for all appropriate sites. 2x
___Neck ___Shoulder ___Arm ___Upper Back ___Leg ___Lower Back [max 10]
___Other (please state where)_____

6. How many days of work have you missed because of pain during the past 18 months? [ ]
___0 days(1) ___1-2 days(2) ___3-7 days(3) ___8-14 days(4) ___15-30 days(5)
___1 month(6) ___2 months(7) ___3-6 months(8) ___6-12 months(9) ___over 1 year(10)

7. How long have you had your current pain problem? Please X only one answer. [ ]
___0-1 week(1) ___1-2 weeks(2) ___3-4 weeks(3) ___4-5 weeks(4) ___6-8 weeks(5)
___9-11 weeks(6) ___3-6 months(7) ___6-9 months(8) ___9-12 months(9) ___over 1 year(10)

8. Is your work heavy or monotonous? Please circle the best answer on a scale from 0 to 10. [ ]
(Not at all) 0 1 2 3 4 5 6 7 8 9 10 (Extremely)

9. How would you rate the pain that you have had during the past week? Circle one. [ ]
(No pain) 0 1 2 3 4 5 6 7 8 9 10 (Pain as bad as it could be)

10. In the past three months, on average, how bad was your pain on a 1-10 scale? Circle one. [ ]
(No Pain) 0 1 2 3 4 5 6 7 8 9 10 (Pain as bad as it could be)

11. How often would you say that you have experience pain episodes, on average, during the past three months? Circle one. [ ]
(Never) 0 1 2 3 4 5 6 7 8 9 10 (Always)

12. Based on all things you do to cope, or deal with your pain, on an average day, how much Are you able to decrease it? Circle one. [10- x]
(No at all) 0 1 2 3 4 5 6 7 8 9 10 (Completely)

13. How tense or anxious have you felt in the past week? Circle one. [ ]
(Absolutely calm and relaxed) 0 1 2 3 4 5 6 7 8 9 10 (As tense and anxious as I've ever felt)

14. How much have you been bothered by feeling depressed in the past week? Circle one. [ ]
(Not at all) 0 1 2 3 4 5 6 7 8 9 10 (Extremely)

15. In your view, how large is the risk that your current pain may become persistent? Circle one. [ ]
(No risk) 0 1 2 3 4 5 6 7 8 9 10 (Very large risk)

16. In your estimation, what are the chances that you will be able to work in six months? Circle one. [10-x]
(No chance) 0 1 2 3 4 5 6 7 8 9 10 (Very large chance)

17. If you take into consideration your work routines, management, salary, promotion possibilities [10-x]
And work mates, how satisfied are you with your job? Circle one.
(Not satisfied at all) 0 1 2 3 4 5 6 7 8 9 10 (Completely satisfied)

Here are some of the things that other people have told us about their pain. For each statement, circle one Number from 0 to 10 to say how much physical activity, such as bending, lifting, walking, or driving, would affect your pain.

18. Physical activity makes my pain worse. [ ]
(Completely disagree) 0 1 2 3 4 5 6 7 8 9 10 (Completely agree)

19. An increase in pain is an indication that I should stop what I'm doing until the pain decreases. [ ]
(Completely Disagree) 0 1 2 3 4 5 6 7 8 9 10 (Completely agree)

20. I should not do my normal work with my present pain. [ ]
(Completely Disagree) 0 1 2 3 4 5 6 7 8 9 10 (Completely agree)

Here is a list of five activities. Circle the one number that best describes your current ability to participate in each of these activities.

21, I can do light work for an hour. [10-x]
(Can't do it because of pain) 0 1 2 3 4 5 6 7 8 9 10 (Can do it without pain being a problem)

22. I can walk for an hour. [10-x]
(Can't do it because of pain) 0 1 2 3 4 5 6 7 8 9 10 (Can do it without pain being a problem)

23. I can do ordinary household chores. [10-x]
(Can't do it because of pain) 0 1 2 3 4 5 6 7 8 9 10 (Can do it without pain being a problem)

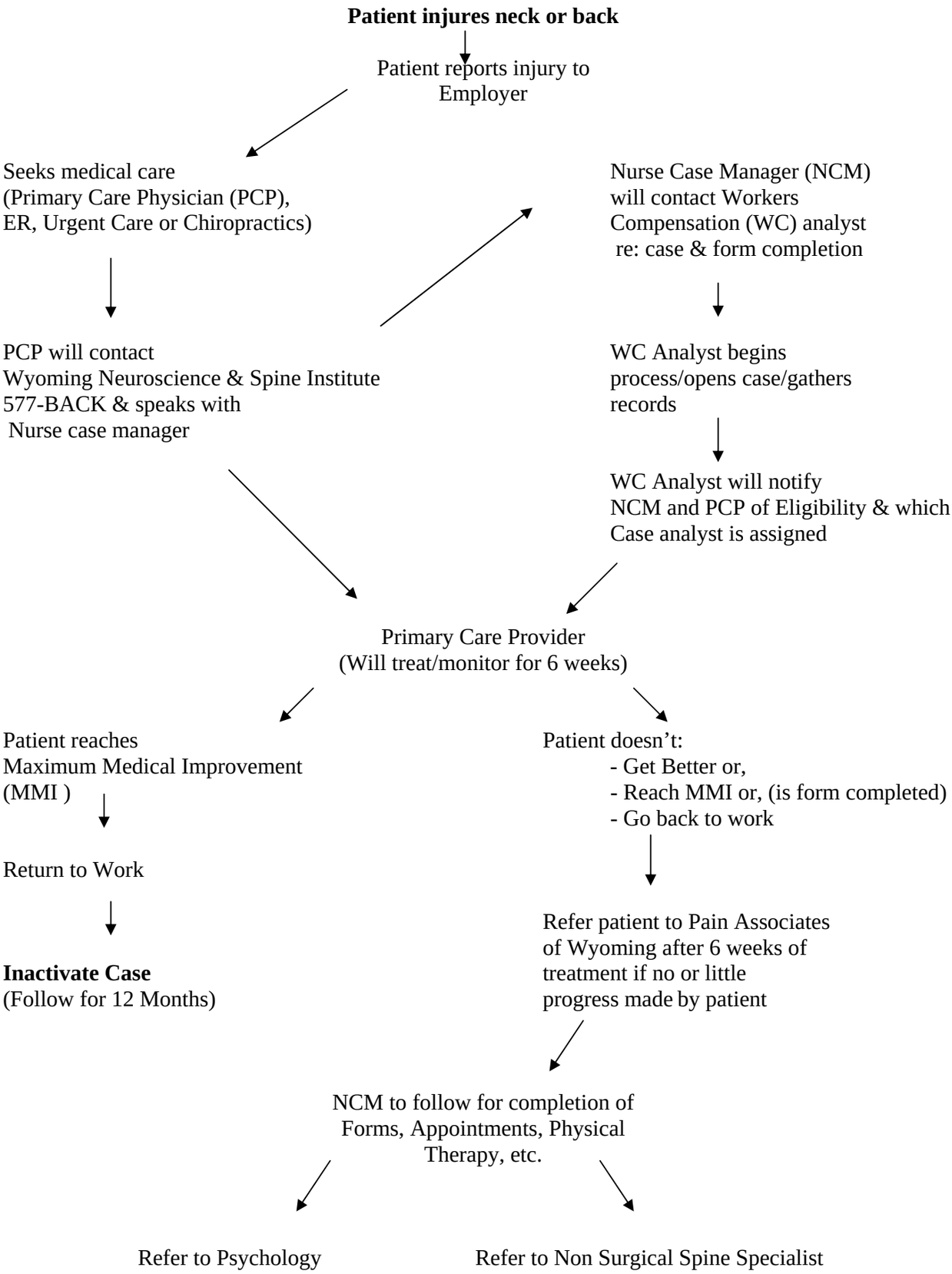
24. I can do the weekly shopping. [10-x]
(Can't do it because of pain) 0 1 2 3 4 5 6 7 8 9 10 (Can do it without pain being a problem)

25. I can sleep at night. [10-x]
(Can't do it because of pain) 0 1 2 3 4 5 6 7 8 9 10 (Can do it without pain being a problem)

Name_____ Date_____

Appendix D

Flow Chart of the OOCCSS System


Patient injures neck or back
Patient reports injury to Employer
Seeks medical care (Primary Care Physician (PCP), ER, Urgent Care or Chiropractics)
Nurse Case Manager (NCM) will contact Workers Compensation (WC) analyst re: case & form completion
PCP will contact Wyoming Neuroscience & Spine Institute 577-BACK & speaks with Nurse case manager
WC Analyst begins process/opens case/gathers records
WC Analyst will notify NCM and PCP of Eligibility & which Case analyst is assigned
Primary Care Provider (Will treat/monitor for 6 weeks)
Patient reaches Maximum Medical Improvement (MMI)
Return to Work
Inactivate Case (Follow for 12 Months)
Patient doesn't:
- Get Better or,
- Reach MMI or, (is form completed)
- Go back to work
Refer patient to Pain Associates of Wyoming after 6 weeks of treatment if no or little progress made by patient
NCM to follow for completion of Forms, Appointments, Physical Therapy, etc.
Refer to Psychology
Refer to Non Surgical Spine Specialist

Appendix E

Educational Sources for Optimal Outcomes With Cost Containment For Spine Services (OOCCSS)

Educational Sources for Participants

Below is an outline of the educational sources for patients enrolled in the Wyoming Workers Safety and Compensation (WWSCD) Pilot Program.

NASS pamphlets will be provided to the patient at specific intervals throughout their treatment within the OOCCSS program

A. Education at Primary Care Providers office:

1. "Back Pain Basics"—25
2. "Back Pain and Emotional Distress"—25
3. "Non-steroidal Anti-inflammatory Drugs—25
4. "Spine Rehabilitation—25

B. Education at Pain Associates of Wyoming

1. Lumbar Spinal Stenosis—25
2. Adult Isthmic Spondylolisthesis—25
3. Cervical Stenosis and Myelopathy—25
4. Magnetic Resonance Imaging—25
5. Electro-diagnostic Testing (EMG/NCS)—25
6. Spinal Injections—25
7. Discography—25
8. Open Discectomy—25
9. Spinal Fusion—25
10. Web based educational materials/videos for patient education: www.swarminteractive.com

Appendix F

Oswestry Disability Index Detailed Results

The Oswestry Disability Index is a tool designed to assist clinicians and researchers as well as disability evaluators to assess a patient's functional level. The test questionnaire has been used for 31 years (Fairbank, 1980) and is considered by some to be the "gold standard" of low back functional outcome tools (Fairbank, 2000).

Distributions for item responses for the Oswestry Disability Index are presented in **Table 1**. Eight of the respondents did not completely fill out the questionnaire, which is taken into account in the mean item scores. Total test scores for respondents were generated by adding up the values for each of the individual questions. The mean for the Oswestry total score was 20 with a standard deviation of 10.3, which was calculated using the 25 participants with who completed each of the Oswestry questions.

Table 1. Oswestry Disability Index descriptive Statistics

	Max	Min	Median	Mean	SD
Oswestry 1	5	0	3	3.1	1.5
Oswestry 2	4	0	2	1.8	1.3
Oswestry 3	5	0	3.5	3.0	1.7
Oswestry 4	5	0	1	2.3	1.9
Oswestry 5	5	0	2	2.5	1.5
Oswestry 6	5	0	2	2.3	1.6
Oswestry 7	5	0	2	2.2	1.2
Oswestry 8	5	0	2	1.9	1.5
Oswestry 9	4	0	2	1.9	1.4
Oswestry 10	4	0	3	2.5	1.2

References

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Fairbank JCT, Couper J, Davies JB. (1980). "The Oswestry low back pain questionnaire." *Physiotherapy*. 66:271-273.

Appendix G

Wyoming Workers' Compensation
Retrospective Data Analysis, 2008-2010

Introduction

Back and neck problems are some of the most commonly encountered issues in clinical practice and are also among the most costly. A survey of adults in the United States had 26% of respondents indicating that they had low back pain and 14% reporting neck pain in the prior three months.[1] Spine pain alone accounted from nearly 3% of all office visits to a physician.[2] With such an increasingly large volume, the question arises: How does such an increase effect associated medical costs? And given the increase in volume of spine pain and the resulting therapeutic procedures, an additional question arises: are outcomes improving, remaining the same, or worsening?

In Wyoming, the city of Casper had the highest rate of back surgeries in the country in 2005, as reported in the Dartmouth Atlas Report's analysis of Medicare enrollees. The rate here was two and-a-half times the national average. How do these numbers compare to workers compensation claimants? Wyoming Worker's Compensation and Safety Division suspected similarly high rates and poor outcomes within their population of workers with spinal injuries, but lacked confirmatory evidence for support. As such, Wyoming Neuroscience and Spine Institute (WNSI) undertook a retrospective study, which aimed to evaluate worker's compensation surgical rates and outcomes including expenditures, workdays lost and visit to providers per claimant in the state of Wyoming's Converse and Natrona counties over a three-year period from 2008 to 2010. The hypothesis of the overall study was that a methodical shift in practice styles for evaluation and treatment of spine injury claimants within the first six weeks of injury would produce better outcomes than the self-directed care that is currently in place. The Family Practice Care Guidelines for low back pain were to be followed. Although OOCCSS has not been in place for a full year, historic trends from 2008-2010 are available for review and discussion. Data on surgical rates for 2011 were not yet available for this study.

1. Total Numbers of Spine Claimants

A Wyoming Worker's Compensation database which included all injuries claimed was obtained by the HCMS Group for the three-year period mentioned above. There were a total of 16,026 claimants in 2008, 13,512 claimants in 2009, and 13,410 claimants in

2010. . Of these claimants, 2461 (15.3%) were from Natrona and Converse counties in 2008, 1996 (14.5%) were from these two counties in 2009 and 2047 (15.2%) were from the two counties in 2010. These numbers were obtained including new claimants in the city of Casper and the towns of Bar Nunn, Edgerton, Evansville, Midwest and Mills in Natrona county and the city of Douglas and towns of Glenrock, Lost Springs and Rolling Hills in Converse county into a database filter.

Once the target geographies were selected as requested by WWSCD, the number of injuries was narrowed down to include only back and neck claimants in Converse and Natrona counties for this three year period. The physical location of injury was obtained by further filtering the injured body part field using codes of 3 (back), 20 (cervical-neck), 36 (mid back, thoracic) and 37 (low back, lumbar). The codes are those used by WWSCD specific to their program. These results are reported in **Table 1**. Also included in **Table 1** is a break down by month over these same three years. It is revealing that of all the injuries reported, spine injuries consistently comprise nearly a quarter of the total volume. Specifically, spine injury claims make up 20% of the total number of Worker's Compensation claims for 2008, 23.9% for 2009 and 21.1% for 2010.

Table 1. WWCSD Spine Claimant Numbers by Month

	2008	**2009**	**2010**	**2011**
January	52	57	42	41
February	43	45	43	30
March	43	60	47	
April	48	43	27	
May	51	27	39	
June	33	35	30	
July	36	37	27	
August	34	28	39	
September	43	35	37	
October	47	38	39	
November	22	37	32	
December	40	36	31	
Total	**492 (20%)**	**478 (23.9%)**	**433 (21.1%)**	

The total number of back and neck claimants in Converse and Natrona counties decreased in each of the three years, by 2.8% (or 14) from 2008 to 2009 and by 9.4% (or 45) from 2009 to 2010. Upon examination, the frequency of new claims was found consistently high numbers of injuries occurring in the months of January, February and March, and consistently lower numbers of injuries reported in June and November. For each of the 3 years, the month with the highest number of claimants was January followed closely by March. The highest isolated month was March 2009 with 60 spine injuries reported. The months within the 3-year period which revealed the lowest number of claimants were November, June, and July. The lowest injury number in an isolated month was May 2009 and July 2010 with both reporting 27 new spine injury claims. The results suggest a seasonal pattern for the new claimant injuries. In order to examine this possibility, historic precipitation and snow levels were obtained from the Weather Warehouse resource website for weather information.[3] Refer to **Table 2** for this information. Using these levels, a Pearson product-moment correlation was performed using each of the 36 months of claimant's data and each of the 36 months of weather data.

Table 2. Snowfall by Month (inches) in Casper 2008-2010

	2008	**2009**	**2010**
January	5.5	16.4	2.8
February	8.8	9.8	5.1
March	18.8	14.5	21
April	13.9	21.3	10.3
May	5.3	0	2.8
June	0	0	0
July	0	0	0
August	0	0	0
September	0	1.30	0
October	9.4	13.8	0
November	0.80	0.6	8.8
December	11.2	19.5	15.8

The correlation with the precipitation did not yield any statistically significant results. The correlation with the snowfall data however, did provide a coefficient with a statistically significant result (coefficient = 0.459, p = 0.005). This result indicates that there is a relationship between the monthly snowfall levels and the number of new back and neck claimants each month. Additionally, the positive correlation coefficient indicates that there is a positive relationship (*i.e.* more snowfall and more claimants). More information would be needed which would look at wind combined with precipitation and temperatures among other factors.

2. Demographics

Demographic information, including gender, age and geography were obtained from the retrospective data. **Table 3** displays the percentage of workers with spine injuries in Natrona and Converse counties who were female for 2008 through 2010. Spine injuries in female workers are notably higher in Natrona and Converse counties than the state average.

Table 3. Percentage of Females Worker's Compensation Claimants

	2008 (%)	2009 (%)	2010 (%)
State (spine)	33.8	37.3	36.7
Natrona & Converse (all)	34.2	38.3	40.1
Natrona & Converse (spine)	43.1	43.2	53.9

Table 4 shows the mean age in years and standard deviation of workers with spine injuries in Natrona and Converse counties. Here, it is noted that ages are about the same for all the variations of fields and years calculated.

Table 4. Mean and Standard Deviation (SD) of Age in Years

	2008 (SD)	2009 (SD)	2010 (SD)
State (spine)	38.6 (13.4)	40.0 (13.4)	40.2 (13.4)
Natrona & Converse (all)	37.5 (13.2)	39.4 (13.3)	39.2 (13.2)
Natrona & Converse (spine)	38.6 (12.4)	38.6 (12.9)	40.7 (13.2)

Table 5 shows the geographic distribution of spine claimants throughout the various towns and cities in Natrona and Converse counties. As predicted by WWSCD the cities of Casper and Douglas have the highest percentage of spine claimants.

Table 5. Geographic Distribution of Spine Claimants

	2008 (%)	2009 (%)	2010 (%)
Bar Nunn	0	0.4	0.2
Casper	75.5	72.9	75.1
Douglas	12.4	14.2	13.1
Edgerton	0.2	0	0.2
Evansville	3.0	3.5	2.8
Glenrock	2.6	3.5	2.3
Midwest	0.9	0.7	1.2
Mills	5.3	4.8	5.1

3. Work Lost

In 2005, the Bureau of Labor and Statistics reported 1.7 million nonfatal occupational spinal injuries.[4] A 2007 paper by Nguyen and Randolph reported that spine injuries result in approximately 149 million days of work lost each year, of which approximately two out of every three days lost are caused by occupational injuries. The economic burden of these lost workdays is substantial, with annual productivity loss estimates at $28 billion.[5] Because of these significant estimates, work days lost were examined in the WWCSD database. As seen in **Table 6**, means and standard deviations were calculated for new spine claimants for the state of Wyoming during 2008, 2009 and 2010. The mean for 2008 is greatest and has the largest standard deviation due to the small number of claimants who remained out of work throughout the period of the dataset. While the mean and standard deviation of the work days lost is important, the numbers cannot be compared directly. Because of this, percentages were computed for Return to Work after six weeks and Return to Work after twelve weeks in order to have reasonable comparisons for this outcome over the three year time period.

Table 6. Work Days Lost for New Spine Claimants in Converse & Natrona

	N	Mean (SD)	Return 6 wks	Return 12 wks
2008	469	109 (235)	71%	77%
2009	457	84 (145)	65%	75%
2010	434	38 (71)	79%	83%

4. Expenditures Reported for Back and Neck Claimants

Occupational spine injuries are among the most significant cost to the Worker's Compensation system. Annual expenditures are estimated at between $20 and $50 billion or approximately 25% of the occupational injury costs. Because of this, expenditures were calculated both in the forms of medical and cash benefit (indemnity) for the three year period examined in this study. Each year revealed average medical costs per spine injury claimant exceeding $10,000, as exhibited in **Table 7**.

Table 7. Expenditures Reported for New Claimants for 2008-2010

	2008 Mean (Std Dev)	2009 Mean (Std Dev)	2010 Mean (Std Dev)
Medical	$12,283 ($49,344)	$11,722 ($32,590)	$10,927 ($57,425)
Indemnity	$6,113 ($38,150)	$5,268 ($15,827)	$4,379 ($18,171)
Total	$18,574 ($84,726)	$17,308 ($46,602)	$15,384 ($74,541)

5. Spine Surgical Rates

State-wide spine surgery rates and associated costs were also calculated and compared to cities in Converse and Natrona counties for the OOCCSS study. Current Procedural Terminology commonly referred to as CPT codes were located in the database and used as identifiers to determine frequency as a method of determining the number of injured workers in 2008, 2009, and 2010 who received spine surgery. To accomplish this, 66 neck and back surgery CPT codes were selected from a total of 2,393 codes found in the database. This significantly trimmed the database from 972,182 potential entries down to approximately 4,800 entries. Next, records were removed that did not use the Body Part Codes as assigned by WWSCD to injuries to the neck or back (3, 20, 36 and 37). This process left 4,689 remaining entries with spine surgery CPT codes for the desired years of interest. Accepting the fact that a single individual would have multiple CPT spine surgery codes assigned to them, appropriate adjustments were made in data mining. The determination was made that there were 548 individuals throughout the state of

Table 8. Surgical CPT Codes

Surgery CPT's	Fusions	Discectomy	Instrumentation	Corpectomy	Other
C- Spine	22551 22552 22554 22595 22600	63020 63040 63045 63075 63076			
T-Spine	22610				
L-Spine	22556 22558 22585 22612 22614 22630 22632	63005 63042 63043 63044 63047			
Spine	22800	63012 63030 63035 63046 63048	22830 22840 22842-22852 22855	63081 63082 63087 63090	22325 – 22328 22523 – 22533 63055 – 63057 22856 22857 69990

Wyoming with the 66 surgical CPT codes examined, listed in **Table 8**. For the sake of brevity for this report designated codes related to spinal fusions, discectomies, and laminectomies are not addressed separately.

Comparison of surgical rates in the state of Wyoming with those in Natrona and Converse counties are detailed in **Table 9**. The table reflects spine surgical rates per 1000 Workers' Compensation claimants in the state. The results are notable for rates comparable to those found in the Dartmouth Atlas report from 2005 for Medicare enrollees where 9.4 out of every 1000 patients had spine surgery.[6] Analysis of the data in the state for every 1000 workers with a spine injury between 9.3 to 15.4 underwent surgery. Rates are even higher for Natrona & Converse where between 10.2 and 16.0 claimants underwent surgery. Addressing outcomes and differentiating types of surgeries matched with histories, physical examination findings, diagnostics, clinical presentations including subjective descriptors of pain are beyond the scope of this report. Matching clinical diagnosis, (ICD9 codes) with surgical interventions is also not addressed.

Table 9. Spine Surgery Comparison

	WWCSD Claimants	Natrona & Converse Claimants	Spine Surgery per 1,000 WC claimants		Discectomy/Laminectomy per 1,000 WC claimants		Fusion per 1,000 WC claimants	
			State	Natrona & Converse	State	Natrona & Converse	State	Natrona & Converse
2008	16,026	2,461	13.6	15.8	11.3	13.4	8.6	10.5
2009	13,512	1,996	15.4	16.0	9.7	15.5	8.5	9.0
2010	13,410	2,047	9.3	10.2	7.2	5.9	4.3	8.3

In 2008, there were 218 unique entries with surgical CPT codes, as seen in the claimant summary information in **Table 10**. The claimants for this year ranged in ages from 21 to 71 years and had a range of days lost from work between 0 and 782 days. The indemnity or cash benefit received ranged from $0 to $520,989, with the high dollar value presumably indicating a cash settlement. The medical benefits ranged from $8,156 to $685,573 with the total benefit ranging from $8,156 to $1,096,445 state-wide. **Table 10** also included summary information on the 39 claimants who either are from Converse and Natrona counties or had their injury's in these counties. These claimants ranged in age from 23 to 60 years. They lost between 0 and 782 days of work. The benefit of these

claimants ranged from $0-$520,989 for cash benefit, from 15,373-573,295 for medical benefit and from 18,630-1,096,445 for the total benefit.

Table 10. Summary Information for Claimants with Spine Surgery for 2008

	State-Wide Mean (Std Dev)	Converse & Natrona Mean (Std Dev)
Number of Claimants	218	39 (18%)
Age	42.9 (10.3)	43.2 (10.8)
Work Loss	263.6 (216.9)	287.5 (229.3)
Incurred Indemnity	$49,348 ($58,441)	$55,334 ($84,552)
Incurred Medical	$103,882 ($93,071)	$120,466 ($106,540)
Incurred Total Cost	$154,878 ($138,853)	$176,801 ($182,437)
Surgery Within the First 6 weeks	29 (13.3%)	5 (12.8%)

Similarly, summary information throughout the state of Wyoming as well as for Converse and Natrona counties for 2009 is listed in **Table 11.** Ages ranged from 22-72 years. Days lost from work ranged from 0-570 days. Cash benefit ranged from $0-$324,990 while medical benefit ranged from $7,874-$340,000. The total benefit ranged from $8,861 to $482,472. For Natrona and Converse counties, claimants' ages ranged from 23-61 years. Days lost from work ranged from 0-546 days. Cash benefit ranged from $0-$101,596 while medical benefit ranged from $16,925-$261,716. The total benefit ranged from $17,719 to $349,948.

Table 11. Summary Information for Claimants with Spine Surgery for 2009

	State-Wide Mean (Std Dev)	Converse & Natrona Mean (Std Dev)
Number	205	32 (15.6%)
Age	43.6 (11.2)	40.4 (10.7)
Work Loss	157.3 (153.4)	200.4 (176.4)
Incurred Indemnity	$28,462 ($35,589)	$35,626 ($33,763)
Incurred Medical	$60,675 ($61,648)	$102,197 ($74,795)
Incurred Total Cost	$89,987 ($86,594)	$138,349 ($99,900)
Surgery Within the First 6 weeks	37 (18%)	9 (28.1%)

Lastly, summary information for claimants in the state of Wyoming and in the study focus areas of Converse and Natrona counties for 2010 is listed in **Table 12.** Throughout the state, ages ranged from 22-67 years. Days lost from work ranged from 0-308 days. Cash benefit ranged from $0-$312,000 while medical benefit ranged from $2,863-$1,135,892. The total benefit ranged from $2,863to $1,450,000. For Natrona and Converse counties, claimants' ages ranged from 23-60 years. Days lost from work ranged from 0-308 days. Cash benefit ranged from $0-$312,000 while medical benefit ranged from $2,354-$1,138,000. The total benefit ranged from $3,403 to $1,450,000.

Table 12. Summary Information for Claimants with Spine Surgery for 2010

	State-Wide Mean (Std Dev)	**Converse & Natrona Mean (Std Dev)**
Number	125	21 (16.8%)
Age	43.2 (11.6)	43.6 (9.8)
Work Loss	118.0 (83.7)	141.9 (102.2)
Incurred Indemnity	$29,424 ($36,985)	$37,541 ($65,312)
Incurred Medical	$81,202 ($132,137)	$118,093 ($236461)
Incurred Total Cost	$110,952 ($165,456)	$156,520 ($300,454)
Surgery Within the First 6 weeks	32 (25.6%)	3 (14.2%)

6. Summary of Retrospective Data Analysis

As speculated, surgery as a treatment approach for spine injuries incurred in the Wyoming workforce is a major contributor to costs. Without necessary information for comparing alternative nonsurgical treatment approaches, one can only draw conclusions from current data. Surgical rates are higher in the workers compensation claimants than in Medicare enrollees and this population has a 2 ½ higher surgical rate than other parts of the U.S. These surgical rates for Workers' Compensation claimants are very costly to both the state and the workers. *Greater than $66 million* was spent on claimants who had spine surgery from 2008-2010. For the injured worker who has spine surgery *greater than 100,000 days of work were missed.* This represents on average *over 6 months of*

work lost for each of the 548 claimants who has spine surgery on work related injuries between 2008 and 2010.

While these high surgical rates for spine injury are compelling in illustrating the need to modify the current claimant-directed model of care, they not conclusive in showing what changes should be made. What is clear from this retrospective study is in the need for improved data collection claimant CPT codes in order to better understand who is getting surgical procedures. The database that provided the 2008-2010 claimant data utilized for this retrospective study had approximately 10,000 claimants without information on their CPT codes. More work is needed to attempt to fill in the voids in order to determine not only the most valuable data points but also the accuracy of the currently available statistics for these years.

References: Appendix G

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