

**Division of Workers'
Compensation Quality
Improvement Program**

**EXECUTIVE SUMMARY
OF THE MEDICAL
TREATMENT GUIDELINE
CASE REVIEW
AND COST STUDIES**



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Division of Workers' Compensation
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The only change to this publication is the addition of this page giving new telephone numbers for the Division which became effective on May 18, 2001. No other changes have been made.

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GENERAL INTRODUCTION

With the enactment of SB 91-218 in July 1991, the Colorado Legislature modified the Colorado Workers' Compensation Act (Act). The Act mandated the Division to develop and implement medical treatment guidelines addressing the most frequent and most costly occupational injuries and/or diseases. The primary purpose of the Medical Treatment Guidelines (guidelines) was to assure appropriate medical care at a reasonable cost. Medical treatment guidelines were developed through a process of consensus incorporating community input. One important use of the guidelines is educational, however, they are enforceable under the Workers' Compensation Rules of Procedure 7 CCR 1101-3. At the same time, the Division recognizes acceptable medical practice may deviate from the Guidelines (Rule XVII, Department of Labor & Employment, 1998).

The Quality Improvement program was formed in 1994 to assess the impact and/or effectiveness of the guidelines. A two-part approach was developed and piloted. The first component of the evaluation, called "Case Review" studies, used medical case record reviews to examine the relationship between physician adherence to the guidelines and patient outcomes. The data for the Case Review Studies were obtained from three managed care organizations who participated voluntarily. The second component, known as "Cost Studies," examined Colorado Compensation Insurance Authority (CCIA, now Pinnacle Assurance) payment records to determine changes in medical services and disability measured before and after the implementation of the guidelines.

The Division developed treatment guidelines for work injuries accounting for the greatest number of claims and the greatest cost. Four guidelines were chosen for study: Occupational Carpal Tunnel Syndrome and Lower Extremity-Knee, enacted in 1995, and Cumulative Trauma Disorder and Shoulder Injury, 1996. Case Review studies were performed on all four guidelines. Cost Studies were performed using the Lower Extremity-Knee and Occupational Carpal Tunnel Syndrome guidelines. For the Shoulder and Cumulative Trauma Disorder guidelines, no funding was available to perform Cost Studies. The results from these studies prompted changes in the Physician Accreditation programs, revisions to the Medical Treatment Guidelines, and other actions designed to improve quality of care and decrease costs.

This report includes an Executive Summary followed by more in-depth summaries of each individual study. The Executive Summary discusses all six studies and their implications for program changes.

EXECUTIVE SUMMARY OF THE MEDICAL TREATMENT GUIDELINES CASE REVIEW AND COST STUDIES

This report summarizes the information obtained from Cost and Case Review studies performed by The Division of Workers' Compensation. The Division undertook these studies to ascertain 1) whether medical practice adhered to the Division's Medical Treatment Guidelines, 2) whether adherence with the guidelines was related to decreased time to Maximum Medical Improvement (MMI), decreased impairment ratings, and increased return to work, and 3) if any cost changes occurred after implementation of the guidelines.

The Case Review Studies used information gained from medical records to examine actual practice patterns. These studies were performed only in urban managed care organizations. Four guidelines were chosen for study: Occupational Carpal Tunnel Syndrome (OCTS), Lower Extremity-Knee, Cumulative Trauma Disorder (CTD) and Shoulder Injury. For purposes of this summary, findings are categorized as "greater than 50% adherence" or "less than 50% adherence" regarding treatment guidelines recommendations.

Due to limited funding, cost studies were performed on the Knee and OCTS guidelines only, utilizing Colorado Compensation Insurance Authority data. These studies provide less information regarding guideline adherence; however they allow some insight into changing medical costs. This information gives some indication of medical treatment areas appearing to utilize the guidelines and areas the guidelines may not adequately address. Costs may increase due to lack of implementation of certain aspects of the guidelines, failure of the guidelines to address specific areas, or increased use of treatment or diagnostic techniques recommended in the guidelines. For purposes of this Executive Summary, some findings are reported as trends of practice in multiple studies; other findings are specific to a particular diagnosis or body part.

The discussion of the findings from the Case Review and Cost Studies is followed by an outline of actions planned by the Division to correct problems identified in the studies. Also noted are areas in which adherence and results are positive, eliminating the need for further action by the Division and saving personnel time and cost to the public.

A more thorough discussion of the purpose and methods for each individual study can be found in the specific report summaries.

Case Review Study Findings With Greater Than 50% Adherence

**Study¹ with GREATER THAN
50% Adherence**

Recommendation	OCTS	Knee	CTD	Shoulder
1. Active Therapeutic Exercise and/or Active Physical Therapy performed	✓	✓	N/A ²	✓
2. Follow-up Diagnostic Procedures , including Magnetic Resonance Imaging and Nerve Conduction Studies, performed to determine the need for surgery.	✓	✓	N/A	✓
3. Surgical Procedures not recommended in the guideline were not performed.	✓	N/A	N/A	✓
4. Conservative Treatment was performed in surgical cases unless acute condition required immediate surgery.	✓	✓	✓	✓
5. Narcotics prescribed for less than two weeks duration.	✓	✓	✓	— ³
6. Diagnostic Laboratory Testing was used sparingly.	✓	N/A	✓	N/A
8. Patient Education was provided by a physician or therapist.	✓	✓	✓	✓
9. Workers Returned To Full-Duty without permanent restrictions at the time of case closure.	✓	✓	✓	✓
10. Injections did not exceed guideline recommendations.	✓	✓	✓	✓

¹ OCTS=Occupational Carpal Tunnel Syndrome; Knee=Lower Extremity—Knee; CTD=Cumulative Trauma Disorder; Shoulder=Shoulder Injury.

² N/A indicates the recommendation was not applicable to the study.

³ “—” indicates less than 50% adherence.

Case Review Study Findings With Less Than 50% Adherence

**Study¹ with LESS THAN
50% Adherence**

Recommendation	OCTS	Knee	CTD	Shoulder
1. Patient Education was performed by a physician within the first two office visits.	✓	✓	✓	✓
2. Psychosocial Evaluations were ordered for cases exceeding 12 weeks.	✓	✓	✓	✓
3. Adherence to Surgical Indications.	— ³	✓	—	—
4. Jobsite Evaluations were requested.	✓	N/A ²	✓	✓
5. Functional Activity Limitations was documented in the patient medical record.	N/A	✓	✓	N/A

¹ OCTS=Occupational Carpal Tunnel Syndrome; Knee=Lower Extremity—Knee; CTD=Cumulative Trauma Disorder; Shoulder=Shoulder Injury.

² N/A indicates the recommendation was not applicable to the study

³ “—” indicates less than 50% adherence.

Comments on Relevant Findings of the Case Review Studies:

- Narcotic use exceeded the 2-week maximum duration parameter on one-half of Shoulder cases for which they were prescribed. In the other case review studies, only a small number of cases exceeded the 2-week parameter.
- Causation is established by correlating physical exam findings to workplace factors. Physicians had difficulty determining causality in CTD cases. No workplace causative factors were identified in 32% of CTD cases. Additionally, 22% of OCTS cases had no abnormal physical findings documented.
- Additional Clinical Factors, which include preexisting diseases and outside work activities, were associated with significant increases in TTD days and MMI in CTD and Shoulder studies. It appears that prompt intervention to identify and/or correct these clinical factors could decrease disability payments and time to MMI.
- Adherence to surgical recommendations was associated with successful return to work in both Knee and OCTS studies. In both conditions, approximately 75% of adherent cases returned to full-duty at case closure.
- Non-adherence to surgical recommendations in OCTS and Knee resulted in less than 50% return to full-duty at case closure. Non-adherence included lack of worksite evaluation in carpal tunnel, and lack of documentation of knee instability or functional activity limitation/impairment.
- Adherence to surgical recommendations in OCTS and Knee resulted in fewer days off work than for cases non-adherent to surgical recommendations.
- Referral to an Orthopedist occurred in less than 50% of Shoulder cases. Of those, 43% had Shoulder surgery. The referral rate and percent of surgery referral appears clinically reasonable.
- Radiology services were performed in 22% of CTD cases. Since x-rays rarely assist in the diagnosis of this condition, use may be excessive.

COST STUDY FINDINGS FOR KNEE AND OCCUPATIONAL CARPAL TUNNEL SYNDROME (OCTS) CONTAINED COSTS & OTHER OUTCOMES IN THE POST-GUIDELINE PERIOD

- Days to MMI did not change in both OCTS and Knee groups.
- Laboratory costs did not increase in the post-guidelines group for both OCTS and Knee.
- Impairment rating for post-guidelines OCTS and Knee cases showed no change.
- Standardized fee scheduled cost and unadjusted total medical costs remained unchanged, for OCTS in the post-guidelines group. During this timeframe, the Medical Consumer Price Index increased in the Denver area by 17.9%.
- Total Physical Medicine costs in OCTS remained unchanged in the post-guidelines group. During this same time, a statistically significant greater number of patients received therapy.
- Radiology costs were not increased in post-guideline OCTS cases.
- Internal Neurolysis, an operative procedure contraindicated in the OCTS guideline, significantly decreased in the post-guidelines group.

Differences Between Pre- And Post-Guideline Periods:

- Cases with permanent disability significantly increased in the post-guidelines period. This could be due to the emphasis the *American Medical Association Guides for the Evaluation of Permanent Impairment* place on surgery as an impairment, or to case severity, which was greater in the post-guidelines group.
- Temporary Partial Disability days for non-surgical patients increased significantly in both post-guideline groups. The treatment guidelines encourage return to modified duty. This could result in an increase in TPD; however, it should have decreased TTD. TTD did not change significantly and is discouraged in the guidelines. TPD days could not be linked to any direct costs because any portion of a day was counted as a full day. The impact on TPD costs is unknown.
- Total unadjusted medical costs for knee cases increased significantly in the Knee post guideline group. This may have been related to the increased case severity and increased number of operative cases in the post-guidelines group.

- Standardized Fee Schedule costs increased significantly in all categories, except pathology and medicine, in the Knee post-guidelines group. When the analysis of costs took into account the increased number of surgical procedures, the only category of procedures continuing to show a post-guideline increase was the Evaluation & Management office visit codes. OCTS showed no increase in evaluation & management codes.
- Surgical Complex Procedures, such as double meniscectomy and anterior cruciate repair, increased in Knee cases. There were significantly more arthroscopies despite a decrease in arthroscopy for debridement post-guidelines.

Other Information Gained From The Cost Studies:

- Psychosocial evaluation was performed in 1% or less of cases lasting longer than three months.
- Nerve conduction studies (NCS) are required prior to OCTS surgery. In both periods, more than 80% of cases had NCS prior to surgery. Forty-five percent of cases having NCS proceeded to surgery. Thus, nerve conduction studies appear to be a cost effective diagnostic tool for OCTS.
- Radiology (x-rays) of the wrist was performed on approximately 30% of OCTS cases. Since national standards are lacking regarding x-rays for OCTS the appropriateness of these x-rays is unknown.
- Magnetic Resonance Imaging (MRI) of the knee may be performed to distinguish surgical from non-surgical cases. There was a significant increase in knee MRI in the post-guidelines group; however, MRI's may have prevented the need for diagnostic arthroscopic surgery in up to 10% of cases.
- X-rays of the knee averaged 1.4 series per case in the Cost Studies. In the Division Case Review Studies, less than 0.6 series per case was ordered. In the absence of a comparison population no conclusions can be drawn about the appropriate use of x-rays.

Implementation of Findings

1. Medical Treatment Guidelines Are Being Reviewed And Updated In 2000 To Incorporate Current Medical Literature And Consensus Recommendations.

- a. The use of diagnostic radiographic imaging for OCTS, Knee, and CTD cases will be investigated further and the conclusions will be incorporated into the guidelines updates.
- b. Narcotic usage among Shoulder cases will also require review. Findings of the Quality study will be presented to the guideline update task force for possible alteration of existing recommendations.
- c. To assure appropriate patient selection criteria, the task force will review knee surgery indications.
- d. Additional information on recommendations for restricted duty days in medical cases will be added to all guidelines.
- e. Guideline revisions will be limited and require less division personnel time due to the adherence shown in laboratory, diagnostic procedures, and other areas.

2. Education To Physicians Will Continue.

- a. Level I Physicians Accreditation Program:
 1. The Accreditation format is being revised to incorporate causation, work site evaluation, and appropriate psychiatric referral. New course introduction planned for October 2000.
 2. Less educational time will be devoted to areas of guidelines adherence as noted in the studies.
- b. Level II Physicians Accreditation Program:
 1. Adherence to surgical indications for OCTS and Knee has been emphasized in Level II Accreditation course since the initial results of the studies were reported in 1998.
 2. Due to the result of the OCTS and Knee Case Review studies, the curriculum was updated in 1999 to include case discussions and testing of psychological disorder and referral, and to increase the emphasis on modification of work duties and worksite evaluation.
 3. January 2001 Accreditation seminar will include cases discussions emphasizing causation and the importance of patient education within the first two visits.
 4. Less educational time will be devoted to areas of guideline adherence.

3. Public Education Is Important To The Overall Implementation Of The Guides. The Following Presentations Have Been Or Will Be Done:

- a. International Association of Industrial Accidents Board & Commission (IAIABC) presentation, October 1998 on OCTS and Knee findings.
- b. Fourth International Congress on Medical Legal Aspects of Work Injuries, abstract presentation on increased return to work for cases complying with guideline surgical indications, June 1999.
- c. Rocky Mountain Occupational Health Conference on OCTS and Knee, January 2000.
- d. Division of Workers' Compensation 2001 Educational Seminar to emphasize findings from studies regarding general adherence and recommendations concerning patient education, functional goals, and psychosocial evaluation on complex cases.
- e. Medical Treatment Guideline seminar in 2001 will have objectives that relate to areas of the guidelines that have been updated, based upon findings of the studies.
- f. Future insurer and employer education to address areas regarding the increased TTD cost caused by clinical factors associated with the original injury, such as aggravation of the condition by non-job related activities and how general medical disease impacts the injury. Coordinating care and benefits to identify and alleviate these conditions may decrease disability costs.

4. Recommended Continuing Actions Based Upon The Division's Studies:

- a. Medical Data Reporting system will be used to identify areas of increasing cost for focused practice-pattern studies.
- b. Identify TPD and TTD day losses associated with various diagnoses and focus efforts to decrease time lost for specific treatment.
- c. Become involved with studies being done in other states to establish comparison measures for practice patterns and costs.

SUMMARY OF THE CASE REVIEW STUDY OF THE CUMULATIVE TRAUMA DISORDER MEDICAL TREATMENT GUIDELINES

Study Objective

In June 1998, after the Division of Workers' Compensation Cumulative Trauma Disorder (CTD) treatment guidelines had been in effect for three years, four Colorado Managed Care organizations, at the request of the Division, performed case reviews to determine physician adherence to the guidelines and patient outcome.

Methodology

A CTD case review questionnaire was developed and piloted in winter of 1998. The questionnaire focused on adherence to recommendations in the guidelines and on return-to-work status of the worker when the authorized treating physician declared the case at maximum medical improvement (MMI). Cases were selected if they had been treated for a work-related cumulative trauma injury after December 31, 1996, and had reached MMI. Questionnaires were completed by chart abstractors trained by the Division Medical Director. Time to MMI was determined from the survey forms; temporary total disability (TTD) days were taken from records kept by the Division. A severity staging matrix is part of the text of the guideline, and cases were classified as stage 1 (mild), stage 2 (moderate), stage 3 (severe) or stage 4 (chronic). Severity criteria included number of symptoms, effect of symptoms on daily activities, secondary symptoms such as depression or sleep disturbance, and response of symptoms to modification of aggravating activity. Consistency of the symptoms and physical findings was also evaluated in the staging analysis; cases whose symptoms were not accompanied by physical findings were graded less severe than cases with equal symptoms and consistent physical examinations.

Results

One hundred seventy-one forms were completed. Forty-seven cases (27%) were men and 124 (73%) were women. The mean age was 39. Most cases were not severe; there were 84 stage 1 cases, 66 stage 2 cases, 20 stage 3 cases, and 1 stage 4 case. There was high physician adherence to recommendations for limiting narcotic use to 2 weeks or less, avoiding more than 4 trigger point injections, using at least 2 forms of conservative treatment before doing surgery, and placing limits on use of manual therapy. Plain x-rays were the most commonly ordered imaging test, done in 38 cases. MRI was ordered in 6 cases and arthrography in one case; CT and bone scan were not used. Documentation of relevant information was a problem in establishing work-relatedness; the chart abstractors could not determine the effect of symptoms on job performance in 66% of cases.

Guideline recommendations for early patient education were followed in only 23% of cases; however, since referral to a physical therapist was done in 81% of cases, it is possible that a majority of patients received timely education on self-management of symptoms and avoidance of further injury. Worksite evaluations are recommended for all cases of CTD, but were neither done nor requested in 61% of cases. The guidelines also recommend that CTD patients being treated with physical modalities also be in an exercise program. The majority of subjects (80%) did receive at least one kind of modality; thermal modalities (heat, ice, paraffin) were used in 118 patients, electrical (TENS, micro current) in 20, and iontophoresis in 85 patients. Exercise programs were documented in 69% of these cases. Surgery was done on only 19 patients, 3 of whom received the recommended worksite evaluations. Psychosocial evaluations were done in 2 patients; the guideline general principles recommend consideration of such evaluations for patients not making expected progress at 6-12 weeks.

The workers in this survey had a good rate of return to work. Ninety-three percent of cases were released to their old jobs without restrictions. Only 7% had any work restrictions at MMI, too small a number to support conclusions regarding associations with guideline adherence. The mean time to MMI was 119 days, and was not associated with case severity or guideline adherence. Most cases (89%) had no TTD days. The number of TTD days was greater in operated than in non-operated cases, and were greater in cases with higher stages of severity.

The survey also examined additional clinical factors (re-injury, pre-existing conditions, aggravation by other activities, adverse reactions to medications, and complications of surgery) as a variable that may influence return to work. TTD days, time to MMI, and upper extremity impairment were positively associated with the presence of these additional clinical factors.

Conclusions

This study has limitations inherent in its design. Convenience sampling was required, limiting the generalizability of our results. It is based on chart review by abstractors who may not find or interpret chart entries correctly. Some measures may have been taken but not documented in a way that the chart review process could identify. Our finding that two-thirds of medical records had no entry describing the effect of symptoms on job performance, for example, does not necessarily mean that it was not asked for or taken into account in those cases. However, it seems likely that there are areas in which documentation is not adequate, suggesting that physician training should emphasize the importance of recording work-related information in the patient's history.

Expensive and sophisticated imaging technology (MRI) was used sparingly, as the guidelines recommend. However, worksite evaluations were underutilized, meaning that there were missed opportunities to detect and change aggravating workplace factors. Among 12 patients who did not return to full duty at MMI, only one had a psychosocial evaluation. It is possible that these also are not being fully utilized in appropriate cases.

The recovery and return to work experience of this population compares favorably with that of other CTD populations. Most cases were seen early and did well. The presence of additional clinical factors such as co-existing medical conditions or re-injury was associated with longer recovery time. With prompt treatment, the majority of CTD cases in these managed care organizations continued to work throughout their course of care. This early attention to CTD may result in reduced costs and disability for a frequently disabling condition.

SUMMARY OF THE CASE REVIEW STUDY OF THE OCCUPATIONAL CARPAL TUNNEL SYNDROME MEDICAL TREATMENT GUIDELINES

Study Objective

In July 1997, after the Division of Worker's Compensation Occupational Carpal Tunnel Treatment Guidelines had been in effect for two years, three Denver area managed care organizations, at the request of the Division, performed case reviews to determine physician adherence to the guidelines and patient outcome.

Methodology

A carpal tunnel case review questionnaire was developed and piloted in the fall of 1996. The intent of the questionnaire was to measure adherence to multiple factors in the guidelines and record the return to work status of the patient when maximum medical improvement (MMI) was declared by the authorized treating physician. Cases were selected if they 1) had a primary diagnosis of a work-related carpal tunnel injury, 2) were first seen after July 1, 1995, 3) were treated for at least 6 weeks, and 4) were at MMI. There were no specific exclusion criteria for other illnesses or injuries.

Results

Seventy-two cases were included in the study. Eight-one percent of the treating physicians reported occupational medicine as their specialty. The mean age of the patients was 40. Seventy-nine percent of the patient sample were females and 18% were males. Ninety-two percent of the patients had job activities requiring continual use of the hands. Twenty-two percent of the cases were reported to have a normal physical exam initially.

Physicians uniformly adhered to the guidelines in the three areas: 1) steroid injections were limited to 3 when performed, 2) narcotics were only used in 2 cases and in those cases did not exceed 2 weeks, and 3) no cases had neurolysis, an operation contraindicated in the guidelines. In addition 85% of the patients received oral medication and 90% were splinted. Seventy-eight percent also participated in an exercise program. These three items are all recommended in the guidelines as conservative therapy.

Several guideline recommendations were not adhered to uniformly. Education of patients during the first 2 visits is recommended in the general principles of all guidelines. It was not documented in 57% of the cases. In addition, work site evaluations are required and

were only performed in 35% of the cases. The most significant deviation from the guidelines occurred in cases with surgery. According to the guidelines, most carpal tunnel patients should have conservative therapy, a worksite evaluation and nerve conduction abnormalities before surgery is performed. In addition, the guidelines allow for several unusual situations to qualify for immediate surgery. All cases received conservative therapy, however, in 23 operated cases no worksite evaluation was done. In 6 operated cases, nerve conduction abnormalities were absent. Of all cases requiring surgery based on guidelines recommendations, 57% received surgery. Of non-surgical medical only cases according to guidelines recommendations, 41% were operated on. This represented an impressive level of non-adherence to surgical indications.

When adherence to the surgical guidelines is compared to the outcome of return to full duty, more interesting results appear. Defining adherence as operating on guideline surgical cases (those meeting indications for surgery) and not operating on guideline medical cases (those not meeting indications for surgery), there were 42 adherent cases and 30 non-adherent cases. The risk of having work restrictions at the end of the case was 26% in adherent cases and 53% in non-adherent cases, representing a doubling of work restrictions in non-adherent cases. In addition, adherent cases had 107 fewer days to MMI (221 days vs. 328 days). Temporary total disability (TTD) days, which are associated with cost of a case, were fewer in cases with documented education in the first two visits (10 days) than in cases with no documented education (84 days). Fewer TTD days were noted in cases with worksite evaluations (36) than in cases without (60).

Conclusion

This study has limitations inherent in its design. Convenience sampling was required, limiting the generalizability of our results. It is based on chart review by abstractors who may not find or interpret chart entries correctly. Additionally, there are several major concerns relating to the clinical practice results. Patient education by the physician does not appear to be occurring and is essential to encourage the patient to make ergonomic work changes. Patients must also have a worksite evaluation to assure injuries do not reoccur. This message needs to be emphasized in physician training. The survey did not establish any significant interference from employers or insurers in obtaining worksite evaluations, however, it is possible there was some resistance from employers or insurers to accomplishing worksite evaluations and these issues were not recorded in the chart. In any case, worksite evaluations need to be encouraged both from the employer and insurer's point of view, as well as the physician's. As in the knee study there is good adherence to recommended conservative treatment in these patients. The lack of adherence to the guideline surgical indications, and poorer outcome associated with lack of adherence is noteworthy. Further emphasis on following surgical indications and worksite evaluations must occur in guideline training courses.

SUMMARY OF THE CASE REVIEW STUDY OF THE SHOULDER INJURY MEDICAL TREATMENT GUIDELINES

Study objective

In June 1998, after the Division of Workers' Compensation Upper Extremity treatment guidelines had been in effect for three years, four Colorado Managed Care organizations, at the request of the Division, performed case reviews to determine physician adherence to the guidelines for shoulder injury and the relationship between adherence and patient outcomes.

Methodology

A Shoulder Injury case review questionnaire was developed and piloted in winter of 1998. The questionnaire focused on adherence to recommendations in the guidelines and on return-to-work status of the worker when the authorized treating physician declared the case at maximum medical improvement (MMI). Cases were selected if they had been treated for a work-related shoulder injury after December 31, 1996, and had reached MMI. Questionnaires were completed by chart abstractors trained by the Division Medical Director. Return to work status at MMI, permanent partial impairment ratings, and time to MMI were the principal outcome measures examined.

Results

One hundred fifty-one forms were completed. The mean age was 41; there were 87 men and 64 women. Nonspecific shoulder pain accounted for 57% of the initial diagnoses; the second most common initial diagnosis was rotator cuff strain/tendonitis in 16.6% of the cases. Physical examination is often inexact in shoulder injuries, and the preponderance of nonspecific pain on the initial evaluation was therefore not surprising.

Acute trauma at work was the commonest occupational factor in the patient history, present in 70% of cases. Tasks involving elevation of the shoulder was also common, reported in 26% of cases, and forceful or repetitive shoulder movement was reported in 22% of cases.

The commonest diagnostic procedures were plain x-ray (58% of cases) and MRI (30% of cases). Twenty-four of the cases initially evaluated as non-specific pain had MRI, and 14 of these were later diagnosed with impingement syndrome or rotator cuff tear, showing that MRI was a useful tool in revealing treatable diagnoses in patients with initially unclear shoulder problems. Forty-seven patients (31% of the sample) had no diagnostic

procedures, and most of these seem to have been uncomplicated cases, with relatively few treatment days and a high rate of timely return to work.

The guidelines recommend early patient education by the treating physician, but documentation that this had been done was found in only 11% of cases. Most patients (76%) had referrals to physical therapy, where education may have been provided. Eighty-two percent of cases had an active therapeutic exercise program, including 39 of the 50 patients who had shoulder immobilization. Workstation analysis is recommended in shoulder injuries when forceful or repetitive shoulder movements are present on the job; of the 33 cases for which this recommendation applies, only 2 had evaluations of their work places.

Narcotic use was more frequent in this survey than in comparable Division surveys of carpal tunnel syndrome, knee injury, or cumulative trauma disorder. Forty-six patients (30%) received narcotics during treatment, including 23 in which more than 2 weeks of narcotic use was recorded. In 5 of these 23 cases, the two weeks of narcotic use occurred after surgery. For 18 of these cases, the two week or more periods of narcotic use occurred either before surgery or when no surgery was done; 11 of the 18 were operated on during the course of treatment.

The guidelines recommend that steroid injections into the shoulder be done only when the patient is more than 30 years old; in this sample, 35 patients received steroid injections, three of whom were between 26 and 29 years old. No case received more than the recommended maximum of 3 steroid injections.

There was generally high adherence to guideline recommendations for initial use of conservative therapy in most shoulder injuries and for use of exercise when thermal modalities are applied. Specialist referrals were made in half the patient sample, the majority to orthopedists or physiatrists. Psychosocial referrals were not done, even when the guidelines would recommend them, as in cases with unexpectedly slow recovery. Other Division guideline studies have also shown low rates of psychosocial referral.

Thirty-one patients (21% of the sample) were operated on, not quite half of those who were referred to an orthopedist for an opinion. Acromioplasty, distal clavicular resection, and rotator cuff repair were the commonest operations.

At the end of treatment, 128 cases were released to work without restrictions, 22 were released with restrictions, and one case did not complete treatment and was lost to follow-up. No permanent impairment rating was recorded in 123 cases (82%); the upper extremity impairment rating in the remaining 28 cases had a mean of 10%. The highest upper extremity rating was 22%, and only 11 cases had upper extremity impairment ratings greater than 10%. Additional clinical and non-clinical factors, such as re-injury on the job, complications of surgery, general medical conditions, missed appointments, and similar problems, were recorded in 49 patients; the presence of these additional factors increased the likelihood that the patient had work restrictions at the end of the case. Such factors also prolonged the duration of the case.

Conclusions

Most cases were adherent to guideline recommendations for surgical indications and diagnostic testing. Guideline recommendations for narcotic use were exceeded in a significant number of cases. The issue of narcotic use will be raised when the guidelines are revised; the task force may decide whether the recommendations should be revised or whether further physician education is needed.

Adherence to recommendations for early physician education and workplace evaluations was low, as was the case in other quality improvement studies. Psychosocial evaluations were rarely done in any guideline study, even when delayed recovery seemed to be occurring. The education of Level II accredited physicians should highlight the utility of these measures.

Additional factors not apparently related to the initial history of injury prolong the course of care and are associated with work restrictions at the end of the case. Physicians should be encouraged to consider such additional factors as evidence of a complicated case, and insurers should be encouraged to authorize treatment of related to associated factors in order to decrease the length of claims.

SUMMARY OF THE CASE REVIEW STUDY OF THE KNEE INJURY MEDICAL TREATMENT GUIDELINES

Study Objective

In July 1997, after the Division of Workers' Compensation Lower Extremity Medical Treatment Guidelines had been in effect for two years, three Denver area managed care organizations, at the request of the Division, performed case reviews to determine physician adherence to the guidelines and patient outcomes.

Methodology

A knee case review questionnaire was developed and piloted in the fall of 1996. The intent of the questionnaire was to measure adherence to multiple factors in the guidelines and to record the return-to-work status of the patient when the authorized treating physician declared maximum medical improvement (MMI). Cases were selected if they: 1) had a primary diagnosis of a work-related knee injury, 2) were first seen after July 1, 1995, 3) were treated for at least 6 weeks, and 4) were at MMI. There were no specific exclusion criteria for illnesses or injuries.

Results

Ninety-six forms were completed. In almost all cases the treating physician was the first physician to see the patient and 73% of the physicians had a practice consisting of 75% or more of workers' compensation cases. The mean age of the patients was thirty-eight years. Sixty-two and one half percent of the patients were men and 34.4% were women. (Three cases had missing information.) Most initial diagnoses were contusion/non-specific knee pain or strain/sprain. Many of these later changed based on diagnostic procedures or arthroscopy, therefore we explored the rate and type of diagnostic testing. Fifteen of the patients having no diagnostic procedures were returned to duty. Eighty patients had at least one procedure, the majority of which were plain x-rays. Approximately half of the patients with non-specific diagnosis or strain or sprain also had an MRI. Sixteen of these 33 cases (48%) were found to have an additional significant diagnosis on MRI. Again it appears MRI was performed appropriately to rule out a significant additional pathological disease requiring other treatment.

Patterns of treatment were then analyzed. Almost uniform adherence was found in the following areas:

- Narcotic use not to exceed 2 weeks
- Duration of cast placement between 3-16 weeks

- Oral steroid not to exceed 2 weeks
- Joint injections not more than 3 or 4 times annually
- Trigger point injections no more than 3-4 times in the same location
- Avoidance of sclerotherapy
- Post-operative return to work in a timely fashion

There was significant variation in the adherence measures for other guideline recommendations. Education during the first two office visits was documented in only about 1/3 of the cases. However, since the majority of the cases were referred to physical therapy, it is reasonable to assume education occurred with the physical therapist. Instruction on exercise or active therapeutic exercise is highly recommended and this occurred in 80 of the 96 cases (or 80%). Seventy-four patients were referred to specialists. Since eighty of the patients had injuries requiring diagnostic testing, it is probably appropriate 74 patients would have been referred to a specialist for further opinion regarding therapy or the need for surgery. Of the 74 patients referred to orthopedists, 39 had surgery and 35 did not. It is essential to remember the population we are reviewing had 6 weeks of treatment; therefore there are few, if any, medical only cases in this population. The population represents a more severe set of cases than the workers' compensation population as a whole. The intent of this study was to review cases more likely to have surgery and thus our surgery rate will be higher than a representative sample of injured workers. Overall the referral rate and rate of surgery, once a patient was referred, seems appropriate and indicates no over-utilization.

A total of 49 patients had an operative procedure. Some patients had more than 1 procedure. Unfortunately many of the patients who had procedures did not have indications documented according to the guidelines. Guideline adherence was measured for ligament repair (1 of 5 adherent), therapeutic arthroscopy (14 of 27 adherent) and for meniscectomy (7 of 17 adherent). These three procedures have different sets of required documentation. The most common missing documentation for meniscectomy was lack of documentation of either activities of daily living or locking on physical exam. The indications for arthroscopies are broader, however, but again the most common missing documentation related to physical findings – no instability noted, no evidence of effusion for two weeks or no notation of severe instability not improving with therapy. Indications for ACL/PCL surgery include documentation of interference with activities of daily living, not present the majority of the time.

These criteria are more stringent than those used in routine medical practice. In the past, physicians were mainly required to document the existence of a pathology and this was sufficient to indicate the need for surgery. If we used this system for indications, the majority of the patients would meet the criteria. Thus most physicians are operating based on documented pathology rather than the specific detailed indications in the guidelines.

We then analyzed the return to work status at the end of the case and compared it to adherence to various factors. Success was defined as return to full duty and non-success as return to duty with limitations. There were no cases in which the patient was not

released to any work. There was a statistically significant association between patients who returned to full duty and those who were operated on according to the surgical indications of the guidelines. Those operated, according to guidelines indications, had odds 4.38 greater for return to full duty than those who were operated on without documentation of surgical indications according to the guideline. Age was a confounding variable and when the statistical relationship is adjusted for age the odds ratio increased to 5.22. Among operated cases, adherence to guidelines was associated with fewer days of temporary total disability, a significant predictor of cost. In addition, it should be noted there was no significant association between initial diagnosis and final diagnosis of severe pathology. This indicates it is appropriate to perform, diagnostic testing and specialist referral in many cases as the true pathology cannot be well differentiated on the first visit.

Conclusions

There is excellent adherence to the guidelines in areas of narcotic and steroid use, post-operative return to work, casting and bracing and active therapeutic exercise. There continues to be lack of documentation regarding patient education although therapeutic exercise and patient education may be occurring in physical therapy which is highly utilized.

There is a significant relationship between adherence to recording the surgical indications as noted in the guidelines and return to full duty. Since the additional functional issues noted in the guidelines are not traditionally recorded in medical practice, education of physicians with an emphasis on guideline surgical indications is warranted. This relationship further suggests the treatment guidelines are emphasizing the correct surgical indications to increase return to full duty outcome. It should be noted the same questionnaires were also filed out by Level II accredited physicians. There is an inherent bias in having the Level II physicians reviewing their own charges as they may record information recalled but not recorded in the actual chart. Under this scenario the relationship between surgical indications and successful return to work is not noted. This may indicate there are other subtle issues occurring between doctors and physicians related to the physicians' emphasis on function. It is likely physicians who record functional activities have spent more time discussing such issues with the patient than physicians who do not record them.

It appears physicians conform to the guidelines when prescribing conservative therapy and diagnostic testing, therefore training does not need to occur in these areas. Physicians could improve their performance by emphasizing patient education and functional progress. Overall it appears when the guidelines for surgical indications are followed, outcome improves and physicians need to be encouraged to adhere to the guidelines for surgical indications and patient education.

SUMMARY OF THE MEDICAL COST AND IMPLEMENTATION OF THE KNEE MEDICAL TREATMENT GUIDELINES

Study Objective

This study compared treatment patterns, worker disability, and medical costs before and after the implementation of the Division's Lower Extremity Medical Treatment Guidelines to determine whether significant changes occurred after the guidelines were implemented.

Methodology

A pre-post research design was used. Colorado Compensation Insurance Authority (CCIA), now known as Pinnacle Assurance, provided data for the analysis. Cases were selected for the study if the diagnostic codes included a primary code for knee injury and if at least three-fourths of all diagnostic codes were knee injury secondary codes. Dates of injury for the pre-guidelines cases were from July 1, 1992 through June 30, 1993, and from July 1, 1995 through June 30, 1996, for the post-guideline cases. Treatment and cost data were collected from payment records on all cases for fifteen months beyond the last date of injury for each respective study period. All claims with a provider overpayment of \$200 or more were excluded. Three thousand sixty-nine cases were included in the analysis—1,560 cases in the pre-guidelines group, and 1,509 cases in the post-guidelines group.

Results

Study variables included measures of date of service, service codes, diagnostic codes, date of injury, disability type, number of lost days, impairment rating, medical payments, and a set of demographic variables, which included the claimant's gender, age, race, occupation, and region of residence. The pre- and post-guidelines groups differed significantly by age and region, but by none of the other demographic variables. Therefore, all analyses of treatment outcomes and costs were weighted by age and region.

Diagnostic codes were used to construct an index of case severity. The post-guidelines period had significantly more cases with diagnostic codes for cruciate ligament and menisci injuries, indicating increased case severity in the post-guidelines cases.

Disability types were medical only, temporary disability, or permanent disability, based on the highest level of disability admitted. The proportion of cases with permanent disability showed a statistically significant increase in the post-guidelines cases, whereas medical-only cases decreased and temporary-disability cases remained virtually the same.

The actual hours lost to TPD were not included in the data set obtained from CCIA. Therefore, any portion of a day lost to TPD was counted as a whole day. The average number of days lost to TPD increased from 44 to 57 days, but this change was not statistically significant.

The pre-to-post difference in days lost to TTD was not statistically significant.

The difference in the number of days from date of injury to date of MMI between the pre- and post-guidelines periods was not statistically significant.

More workers incurred permanent disability in period two, but the difference in the mean impairment ratings between periods was not statistically significant. The increased number of permanent disability claims could have been due to the increasing use of the AMA's *Guides to the Evaluation of Permanent Impairment*, Third Revised Edition, or to increased case severity in the post-guidelines group.

The analysis of medical costs included an examination of both total medical dollars paid for all services and standardized costs for fee-scheduled services. No adjustments for inflation were made for either set of costs. Total medical dollars paid increased a statistically significant 42% between the pre- and post-guidelines period. During the same period of time, the Denver medical consumer price index showed a 17.9% increase. The cost difference between the two study periods may be due to the significantly larger number of surgical cases in the post-guidelines group.

The Colorado Fee Schedule, specifying maximum reimbursement levels for professional services, was revised in October 1995, during the post-guidelines period. Therefore, to compare costs between study periods, fee-schedule costs were "standardized" by setting the pre-guidelines costs equal to post-guidelines costs. These adjusted costs, which were not measures of actual costs, were estimates used to compare relative changes in cost over time. Total standardized fee-schedule costs, weighted for age and region, were significantly higher in the post-guidelines period. However, when the data were weighted for the increased number of surgical cases in the post-guidelines period, the statistically significant increase disappeared. Thus, the number of surgical procedures accounted for the increase in standardized fee-schedule costs.

Standardized fee-schedule costs for specific procedures, including anesthesia, minor-surgical procedures, surgery, radiology, physical medicine, and evaluation and management, all showed statistically significant increases in the post-guidelines period. Because surgery alone can lead to cost increases in these categories, the data were weighted for surgery, as well as age and region. After weighting, the evaluation & management codes still showed a significant increase, medicine showed a significant decrease, and the significant pre-post differences for the other categories disappeared. The decrease in medicine fees may reflect a change in the protocol for supply codes.

There was a statistically significant increase in the number of surgical cases in the post-guidelines period, with more services rendered for diagnoses involving injuries of the

cruciate ligaments and menisci. Consequently, the impact of the increased number of surgeries on other outcomes was examined.

Among patients having surgery, there was a small, statistically insignificant increase in the number of TPD. However, among patients not having surgery, there was a statistically significant increase in the number of TPD days between the pre- and post-guidelines periods. This increase in TPD was not due to case severity, since weighting the data for case severity did not eliminate the statistically significant difference.

The pre-to-post difference in the number of days lost to TTD was not statistically significant for either the surgical or non-surgical cases.

The average number of TTD days was about three times greater for surgical than non-surgical cases in both the pre- and post-guidelines periods.

There were no statistically significant differences in days to MMI or impairment ratings for both surgical cases and non-surgical cases between the pre- and post-guidelines periods.

Pre-post differences in average standardized fee-schedule costs for surgical cases were not statistically significant. On the other hand, fee-schedule costs for post-guidelines non-surgical cases increased significantly, which may have been due to the significantly higher use of physical medicine in period two.

Selected categories of procedure codes were analyzed. The small number of pathology codes suggested that few lab tests were ordered and those that were appeared related to surgical requirements. This is consistent with the guidelines. There was a significant increase in evaluation & management costs in the post-guidelines period. The reason for this was not evident and further investigation is needed. Overall, very few psychological evaluations were ordered, even in cases where an evaluation would have been warranted by the guidelines. And finally, there was an increase in both x-rays and MRIs, which may have been due to the increase in the number of surgeries during the post-guidelines period.

Conclusions

This study uncovered some reassuring findings and identified some issues requiring review or action.

As compared to the pre-guidelines group, patients in the post-guidelines group were more likely to be categorized as severe, have surgery and suffer more permanent disability. These indicators of severity are associated with an increase in the number and complexity of services to treat the patients, and therefore appear to account for most of the cost increases in period two. However, whether the surgical cases met surgical criteria as

outlined in the Division's Lower Extremity Medical Treatment Guidelines could not be addressed in this study.

Costs for evaluation and management showed a statistically significant increase, even when weighted for surgery. Further investigation is needed to explain this increase.

This study revealed numerous plain knee x-rays in both periods. Because current literature suggests that plain x-rays should be limited in use as a diagnostic tool, the Division's task force will be asked to add clearer and stricter parameters on the use of plain x-rays to the Lower Extremity Medical Treatment Guidelines.

There was a significant increase in the use of Magnetic Resonance Imaging (MRI) in the post-guidelines groups. Current literature supports the use of MRIs to diagnose surgical conditions. The post-guidelines increase in MRIs was associated with a decrease in diagnostic arthroscopies, suggesting their use may have prevented unnecessary surgery. The recommendation to use MRIs to diagnose surgical conditions will be clarified and strengthened in the Lower Extremity Medical Treatment Guidelines, and included in the Division's Level I and Level II Accreditation programs

Too few psychological evaluations were done in cases that were not progressing at six to twelve weeks. Current literature indicates that treating mental health conditions may reduce the overall medical and disability costs of physical injuries, a finding that will be brought to the attention of physicians and insurers in future seminars.

Finally, there was a significant post-guidelines increase in TPD days for non-surgical cases without a corresponding decrease in TTD days, and the length of disability for patients undergoing surgery to repair cruciate ligaments and menisci exceeded the knee injury medical treatment guidelines. The task force will be asked to develop clearer guidelines for disability days for both surgical and non-surgical diagnoses to ensure that claimants return to work at the appropriate time and to control disability costs.

SUMMARY OF THE MEDICAL COST AND IMPLEMENTATION OF THE OCCUPATIONAL CARPAL TUNNEL SYNDROME MEDICAL TREATMENT GUIDELINES

Study Objective

This study compared treatment patterns, worker disability, and medical costs before and after the implementation of the Division's Occupational Carpal Tunnel Syndrome Medical Treatment Guidelines to determine whether significant changes occurred after the guidelines were implemented.

Methodology

A pre-post research design was used. Colorado Compensation Insurance Authority (CCIA), now known as Pinnacle Assurance, provided data for the analysis. Cases were selected for the study if the diagnostic codes included a primary code for carpal tunnel syndrome and if at least three-fourths of all diagnostic codes were carpal tunnel secondary codes. Dates of injury for the pre-guidelines cases were from July 1, 1992 through June 30, 1993, and from July 1, 1995 through June 30, 1996, for the post-guideline cases. Treatment and cost data were collected from payment records on all cases for fifteen months beyond the last date of injury for each respective study period. All claims with a provider overpayment of \$200 or more were excluded, as were cases having surgery on, or a fracture to, body parts other than the wrist or forearm. Seven hundred and five cases were included in the analysis-- 373 cases in the pre-guidelines group, and 332 in the post-guidelines group.

Results

Study variables included measures of date of service, service codes, diagnostic codes, date of injury, disability type, number of lost days, impairment rating, medical payments, and a set of demographic variables, which included the claimant's gender, age, race, occupation, and region of residence. There were no significant differences between the two groups on any of the demographic variables.

Diagnostic codes were used to construct an index of case severity. The post-guidelines period had significantly more cases with diagnostic codes for nerve injury, indicating increased case severity in the post-guidelines cases.

Disability types were medical only, temporary disability, or permanent disability, based on the highest level of disability admitted. The proportion of cases with permanent

disability showed a statistically significant increase in the post-guidelines cases, whereas both medical-only and temporary-disability cases decreased slightly in period two.

The actual hours lost to TPD were not included in the data set obtained from CCIA. Therefore, any portion of a day lost to TPD was counted as a whole day. The average number of days lost to TPD increased from 71 to 110 days, but this change was not statistically significant.

There was a statistically significant increase in days lost to TTD from period one to period two. This difference is probably due to case severity, since weighting the data for case severity eliminated the statistically significant difference.

The difference in the number of days from date of injury to date of MMI between the pre- and post-guidelines periods was not statistically significant.

More workers incurred permanent disability in period two, but the difference in the mean impairment ratings between periods was not statistically significant. The increased number of permanent disability claims could have been due to the increasing use of the AMA's *Guides to the Evaluation of Permanent Impairment*, Third Revised Edition, or to increased case severity in the post-guidelines group.

The analysis of medical costs examined both total medical dollars paid for all services and standardized costs for fee-scheduled services. No adjustments for inflation were made for either set of costs. Total medical dollars paid increased less than 1% between the pre- and post-guidelines period, a change that was not statistically significant. During same period of time, the Denver medical consumer price index showed a 17.9% increase.

The Colorado Fee Schedule, specifying maximum reimbursement levels for professional services, was revised in October 1995, during the post-guidelines period. Therefore, to compare costs between study periods, fee-schedule costs were "standardized" by setting the pre-guideline costs equal to post-guideline costs. These adjusted costs, which were not measures of actual costs, were estimates used to compare relative changes in costs over time. Standardized fee-schedule medical costs were lower in the post-guidelines period, but this difference was not statistically significant.

There was no significant difference in the number of surgical cases between the pre- and post-guidelines periods, although there was a slight decrease in the percent of cases requiring surgery. Internal neurolysis, an operative procedure contraindicated in the guidelines, significantly decreased in the post-guidelines period.

Among patients having surgery, there was a small, statistically insignificant decrease in the number of TPD. However, among patients not having surgery, there was a statistically significant increase in the number of TPD days between the pre- and post-guidelines periods. This increase was not entirely accounted for by case severity. The average number of days lost to TPD was greater for non-surgical cases than for surgical cases in both pre- and post-guidelines periods.

The pre-to-post difference in the number of days lost to TTD was not statistically significant for either the surgical or non-surgical cases.

The average number of TTD days was greater for non-surgical than surgical cases in both the pre- and post-guidelines periods.

There were no statistically significant differences in days to MMI or impairment ratings for both surgical cases and non-surgical cases between the pre- and post-guidelines periods.

Average standardized fee-schedule costs for surgical cases far exceeded those for non-surgical cases in both the pre- and post-guidelines periods. On the other hand, the pre-post cost difference was not statistically significant for either the surgical cases or the non-surgical cases.

There was a decrease in the per-case cost and a decrease in the post-guidelines standardized fee-schedule costs for anesthesia, surgery, radiology, pathology, medicine and evaluation and management. No other significant changes were noted.

The rate of psychosocial evaluations ordered on cases lasting more than 90 days was very low in both the pre- and post-guidelines periods.

Cases receiving physical therapy were significantly more frequent in the post-guidelines group. Despite this finding, the mean physical medicine cost for all post-guidelines cases decreased, though not significantly.

Conclusions

Total non-standardized medical costs increased less than 1% while the Denver medical consumer price index showed a 17.9% increase. Standardized fee-scheduled costs decreased slightly but did not change significantly pre-to-post guidelines. The guidelines appear to be contributing to controlling medical costs. There is no evidence of a need for drastic changes to the guidelines.

The significant increase in TPD days lost for non-surgical cases is not related to case severity. The indices of time off for cases in this study exceeded those from several other studies. Physicians need to be encouraged to return patients to modified and full-work environment more quickly and employers need encouragement to offer modified duty. In addition, the division and insurers should assess the need for employers to provide progressive, modified duty and more timely work site evaluations to avoid delays in release to full duty.

The level of physical therapy reported was unexpectedly high, but may be consistent with recommendations to educate patients on self-management of carpal tunnel. The

guidelines do not clearly advocate these services and the task force revising the guidelines may need to better define indications for their use.

Overall, the implementation of the treatment guidelines may have contributed to controlling medical costs. Further emphasis needs to be placed on controlling disability days.