

**Cost Estimate Comparing the AMA *Guides*
Third Edition Revised to the Fourth or Fifth Editions for
Colorado Workers' Compensation Impairment Ratings**

State of Colorado
Department of Labor and Employment
DIVISION OF WORKERS' COMPENSATION



Bill Owens, Governor

Jeffrey M. Wells, Executive Director

MaryAnn Whiteside, Director

MAY 2003

This report can be accessed through the Division's homepage at
<http://www.coworkforce.com/DWC>

For more information, contact:

Policy Research Section
1515 Arapahoe Street, Tower 2, Suite 610
Denver, CO 80202-2117
303.318.8765

or

email to debra.northrup@state.co.us regarding medical issues

or

donald.pfost@state.co.us regarding statistical issues

This research was prepared by staff of the Colorado Division of Workers'
Compensation:

Kathryn L. Mueller, MD
Martha M. McReynolds, PhD
Douglas Van Zet, BS
Donald R. Pfost, PhD
Edward B. Whitney, MD
Debra J. Northup, RN

with the assistance of Christopher R. Brigham, MD of Brigham and Associates, Inc.
Thanks also to Joseph Winter for suggestions regarding the data analysis and to
Susan Roughton, MHA, for drafting the Executive Summary.

MAY 2003

TABLE OF CONTENTS

Executive Summary	5
Introduction	8
Methods	11
PPD Benefit Formulas.....	12
Sampling.....	12
Scheduled Sampling Stratification.....	14
Whole Person Sampling Stratification.....	15
Random Sampling.....	16
Screening.....	16
Category Case Descriptions.....	19
Interrater Reliability.....	19
Calculating Cost Estimates.....	20
Results	22
Discussion	24
Other Costs.....	26
Key Assumptions.....	27
Limitations.....	28
Conclusion.....	29
Appendix A	30
Instructions Given to AMA <i>Guides</i> Expert During Case Review.....	30
Attachment to Appendix A	31
Colorado Impairment Rating Directions.....	31
Appendix B	34
The Closed Claim Studies.....	34
Appendix C	35
Analysis of PPD Cases with 1% Impairment/Body Part 1 (Arm at Shoulder).....	35
Appendix D	38
Check List of Screening Criteria.....	38
Upper/Lower Extremity Case Category.....	38
Whole Person – Case Category.....	40

Appendix E	42
Rejected Cases.....	42
Appendix F	45
Scatter Plots of Correlations between Ratings of Expert Reviewer and Medical Director on Whole Person Cases for 3 rd , 4 th and 5 th Editions of <i>AMA Guides</i>	45
Appendix G	47
Detailed Cost Estimates.....	47
References	48

Tables

Table 1. Upper Extremity Stratification.....	15
Table 2. Lower Extremity Stratification.....	15
Table 3. Whole Person Stratification.....	16
Table 4. Reasons for Rejection.....	18
Table 5. Interrater Reliability: Intraclass Correlation Coefficients.....	20
Table 6. Estimated Annual PPD Costs in Millions of Dollars.....	22
Table 7. Estimated Annual Difference in PPD Costs in Millions of Dollars.....	22

EXECUTIVE SUMMARY

In Colorado, an estimated 16-20% of the total workers' compensation benefit costs reflect permanent partial disability (PPD) benefits paid to injured workers. As PPD benefits rely on an impairment rating provided by a Division of Workers' Compensation (Division) accredited physician, the method of determining an impairment rating directly impacts workers' compensation system costs. The Colorado statute CRS 8-42-101 (3) (a) (I) et al. specifies that Division-accredited physicians rate impairment using the American Medical Association's *Guides to the Evaluation of Permanent Impairment*, Third Edition Revised (Third Edition), which was incorporated into the Workers' Compensation Act under SB91-218 as the edition "in effect as of July 1, 1991." Two subsequent editions of the AMA Guides were published following July 1, 1991, specifically, the Fourth Edition in 1993 and the Fifth Edition in November 2000.

The Workers' Compensation Act, however, did not change to reflect the use of revised editions. Colorado physicians have requested that the Division incorporate the current 5th edition because the AMA *Guides* Third Edition is outdated, and thus, inconsistent with current medical models, including disability rating systems found in personal injury (automobile) and federal employees' injury cases. Likewise, the AMA provides continuing education to physicians on the Fifth Edition only, which is used by 41 out of 47 U.S. jurisdictions for workers' compensation and personal injury. Moreover, the state of Colorado is the only jurisdiction mandating the use of AMA *Guides* Third Edition.

The Division surveyed other states seeking information on the impact to impairment ratings or system cost of changing from the Third Edition to the Fourth or Fifth Editions, but no other state had information regarding this change. In addition, a comprehensive medical literature search failed to reveal published research regarding this issue. In order to acquire information about the differences among the three editions, the Division engaged an expert in impairment ratings (Christopher Brigham, MD) to identify and explore the differences among the three editions. Results are reported in the "Study of the Impact on Changing from the American Medical Association (AMA) *Guides to the Evaluation of Permanent Impairment*, Third Edition Revised to the Fourth or Fifth Editions in Determining Workers' Compensation Impairment Ratings."

The design of the study required an impairment ratings expert to rate a sample of Colorado workers' compensation closed PPD cases three separate times; the first using the AMA *Guides* Third Edition Revised, the second using the Fourth Edition, and the third using the Fifth Edition. Then, the differences between the Third Edition Revised and the other editions were calculated both for ratings and for PPD benefit costs. A sample pool of 19,935 PPD cases used for this study included 7,964 whole person, 7,664 upper extremity, and 4,307 lower extremity

cases drawn from data sets created for the Colorado Closed Claim Studies of fiscal years 2000 and 2001.

Stratifications were developed within each category so that sampling represented the population of Colorado workers' compensation cases, taking into account both the entire range of impairment ratings and the best estimation of costs. Medical case records from the initial sample were screened to determine their adequacy for the study and cases that failed to meet specified criteria were rejected. The final sample consisted of a total of 250 cases: 150 whole person, 60 lower extremity, and 40 upper extremity cases. The reliability of the study's impairment ratings methodology was assessed with the addition of a second impairment ratings expert who separately rated approximately 20% of the 250 cases selected at random: 28 whole person, 12 lower extremity, and 7 upper extremity cases. The inter-rater reliability was satisfactory ($r \geq .893$) for all ratings with the exception of the Fourth Edition whole person ratings ($r = .583$).

The Brigham portion of this study reports opportunities for improvement, qualitative comparisons and changes in impairment rating percentages using the three different editions. Specific findings include: 1) The Third Edition is an outdated approach to assessing musculoskeletal impairment, 2) The Fourth and Fifth editions will require more effort and discernment by the rating physicians and result in lower ratings, 3) There are major advancements in the Fourth and Fifth editions for the assessment of spinal and lower extremity impairment, 4) The Fifth Edition is the most current and widely used Edition, and 5) The Fourth Edition requires spine injuries to be rated at the time of injury without allowing for improvements after healing has occurred. The sample used in the cost study had to consist of case reports at the time of MMI; therefore, the estimated spinal ratings using the Fourth Edition at MMI are lower than if the spine injuries were rated at the time of injury.

The Division used the impairment ratings from the Brigham portion of this study to estimate the system-wide PPD cost impact of changing to an updated edition of the AMA Guides in "Cost Estimate Comparing the AMA *Guides* Third Edition Revised to the Fourth or Fifth Editions for Colorado Workers' Compensation Impairment Ratings." The estimated reduction in state of Colorado workers' compensation system costs by using the Fifth Edition instead of the Third Edition during one year of permanent partial benefit payments is approximately \$30.7 million, and by using the Fourth Edition instead of the Third Edition during one year of permanent partial benefit payments is \$43.5 million. Cost differences are more predictable for the Fifth than for the Fourth Edition, and associated litigation and implementation costs are likely to be lower for the Fifth than for the Fourth Edition. These estimates assume an immediate implementation of the newer version of the *Guides* for all open PPD claims. Another important assumption is

that the Division's interpretive assistance in use of the *AMA Guides*, including the Physician's Accreditation Program, will continue to improve Colorado physicians use of the newer edition.

Adopting either the Fourth or Fifth edition of the *AMA Guides* has additional cost implications not quantified in the study; for example, training expenses will be incurred upon adoption of either edition, as all Division-accredited physicians will be required to attend a training seminar. Many Division-accredited physicians are already familiar with using the Fifth Edition in determining impairment ratings for other systems outside of workers' compensation, such as the federal government, automobile, and personal injury cases. Thus, training expenses may be less by adopting the Fifth Edition. Adopting the Fourth Edition for workers' compensation, in contrast, may potentially cause confusion and may lead to additional administrative and/or training costs for the Division's Accreditation Program.

In this study, expert authorities in the use of the *AMA Guides* determined impairment ratings. In terms of generalisability of the results, Colorado physicians have comparably less experience and expertise in using the *AMA Guides* and applying them to the cases they rate. Many existing aspects of the Division's Accreditation program are expected to reduce such variation in impairment ratings, yet the expected decrease greatly relies on continued oversight, guidance and interpretation from the Division's medical programs. Overall, the study predicts a decrease in system-wide PPD compensation costs following the adoption of a more recent edition of the *AMA Guides*. The magnitude of the decrease for the 5th edition is a more reliable estimate than the predicted decrease from the 4th edition due to the potential for increased litigation, and the higher enforcement and training costs expected from adopting an outdated edition.

INTRODUCTION

The Colorado Workers' Compensation Act requires that permanent partial disability (PPD) benefits be paid if, following maximum medical improvement, the injured worker still suffers permanent medical impairment due to the work-related injury. PPD benefits represent the amount of money injured workers may receive as partial compensation for expected loss of future wages caused by their on-the-job injury. The benefit can be either calculated as a "whole person" or "scheduled" award depending on the part of the body that was injured. In either case, the PPD benefits are determined using a formula that heavily relies on the impairment rating provided by a Division of Workers' Compensation (DOWC) accredited physician.

In Colorado, total costs for PPD permanent impairment benefits are estimated to be on the order of 16-20% of the total workers' compensation benefit costs.¹ Therefore, the method by which the physician makes the impairment rating has an impact on workers' compensation system costs, and on the insurance premiums paid by Colorado employers.

The Colorado statute specifies that the American Medical Association *Guides to the Evaluation of Permanent Impairment*, Third Edition Revised must be used to rate permanent impairment (CRS 8-42-101 (3) (a) (I) et al.). The Third Edition Revised was published in 1990, and was incorporated into the workers' compensation act under SB91-218 as the edition "in effect as of July 1, 1991". The Fourth Edition was published in 1993 and the Fifth, in November 2000. Because of these newer editions, the State of Colorado is the only jurisdiction that still mandates the use of the Third Revised Edition.

The AMA *Guides* was included in SB91-218 in order to create a consistent medical impairment rating system that would provide both reproducible results, and similar ratings for similar injuries. Several other medical programs were created by the same legislation to further support the medical ratings, treatment, decisions, and management of workers' compensation cases. Important assumptions included in making this study were that the DOWC accreditation of physicians would continue, and further, that the DOWC impairment rating system would continue to provide guidance regarding how the AMA *Guides* would be implemented in Colorado workers' compensation cases. Currently, the Level II Accreditation program uses the AMA *Guides*, Third Revised Edition, supplemental rating information in DOWC's Rule XIX and clarifications in the

¹ Based on NCCI, personal communication

curriculum as the framework within which Colorado physicians are taught to evaluate and report medical impairment. The Level II program helps to standardize the impairment rating process through a series of seminars that provide training to physicians in performing medical impairment ratings. Although this study assumes that these programs continue, currently they are scheduled to sunset on July 1, 2003.

Numerous Colorado physicians have requested the DOWC to move to a more current edition of the *AMA Guides* due to the conflicts with current medical models and with disability rating systems found in personal injury (automobile) and federal employees' injury cases. For these reasons and the scheduled sunset in 2003 of several DOWC medical programs dealing with impairment ratings, DOWC surveyed other states during 2000 seeking information regarding the impact on impairment ratings of changing from the Third Edition Revised to the Fourth or Fifth Editions, but no other state was found that had information regarding this change. Further, a search of the medical literature revealed no published research regarding this issue.

Therefore, because the choice of *AMA Guides* edition has such a clear impact on both the workers' compensation system costs and the maintenance of as non-adversarial and self-administering a system as possible, it was agreed that responsible action required reliable information. Therefore, the DOWC, with funding support from the Colorado legislature, initiated a study of the impact of changing from the Third Edition Revised to either the Fourth or Fifth Editions. The study involved both internal and contract staff.

Part of the study involved qualitative comparisons of the clarity, variability, and simplicity of the rating systems presented in the various *Guides*' Editions. The degree of clarity, variability and simplicity may forecast disputes and litigation with the use of the various editions. Additionally, these factors are relevant if the DOWC must update its impairment rating guidelines to match an updated *Guides* edition. Other portions of the study involved estimating the impact on impairment rating percentages and on overall costs for the PPD benefits for Colorado's workers' compensation system using the different Editions.

The qualitative comparisons and the changes in impairment rating percentages using the three different editions are reported in the companion document, "Study of the Impact on Changing from the American Medical Association (AMA) *Guides to the Evaluation of Permanent Impairment*, Third Edition Revised to the Fourth or Fifth Editions in Determining Workers' Compensation Impairment Ratings" by Christopher R. Brigham, MD, June 30, 2002.

The purpose of the portion of the study reported here is to estimate the system-wide PPD cost impact of changing AMA editions. This involves applying impairment rating percentages estimated under each edition of the *AMA Guides* to benefit calculations for PPD benefits in the Colorado workers' compensation system. Additionally, this research attempted to provide some level of confidence regarding the estimated differences in cost found among the various editions of the *Guides*.

Important assumptions were used in reaching this study's final conclusions regarding cost differences, and these assumptions should be taken into account if the results of the study are applied in the future to the Colorado workers' compensation system.

METHODS

The basic study design required an expert in impairment ratings to provide three ratings for a sample of 250 actual Colorado workers' compensation closed PPD cases, one rating using the Third Edition, Revised, a second rating using the Fourth Edition, and a third rating using the Fifth Edition. These ratings were created using the medical narrative report required for Colorado PPD benefit "admissions", documents payers file with the division acknowledging liability for medical and indemnity benefits to be paid to injured workers. It was clear that these administrative reports frequently would not have adequate information to create ratings using all three editions, so a DOWC reviewer screened the randomly sampled reports prior to including them in the study. The accepted cases were reviewed by the expert reviewer in the following order: half the whole person randomly sorted cases, half the upper extremity randomly sorted cases and half the lower extremity randomly sorted cases, followed by the other half of each randomly sorted category. The expert rated each case using all three *Guides* editions. He followed a set of rating guidelines developed in collaboration with the DOWC's Medical Director, and a set of directions for using the *Guides* in Colorado (see Appendix A for these guidelines and directions). The expert reviewer's impairment ratings using the different editions were substituted in the PPD benefit formulas to estimate the PPD benefit costs had those editions been in effect. The difference in total cost between the Third Edition Revised and the Fourth Edition was estimated, as was the difference in cost between the Third Edition Revised and the Fifth.

The expert reviewer also qualitatively discussed differences and problems found in the three editions of the *AMA Guides*. This discussion is relevant to anticipating costs other than the straightforward PPD benefit cost, or implementation problems that might be associated with the different editions. These discussions include issues such as how clearly rating procedures are explained, ease in creating the ratings using the different methods, and recommendations for the DOWC to limit or otherwise provide guidance in the use of any of the editions. The impairment ratings and qualitative analysis by the contract reviewer are documented in "Study of the Impact on Changing from the American Medical Association (AMA) *Guides to the Evaluation of Permanent Impairment*, Third Edition Revised to the Fourth or Fifth Editions in Determining Workers' Compensation Impairment Ratings" by Christopher R. Brigham, MD, June 30, 2002.

The research design relied upon one expert reviewer as an estimator of the difference in ratings across editions. This design is most likely to arrive at valid estimates if the *Guides*, used in conjunction with our Colorado interpretations,

provide a reproducible impairment rating methodology when used by trained physicians. Therefore, the research design called for a second expert to review some of the study cases in order to assess the reliability of the impairment ratings methodology. The interrater reliability was good for all except the Fourth Edition whole person ratings. The reliability was not satisfactory for those Fourth Edition cases. Therefore, concerns remain regarding the reliability of the system wide cost estimate presented here for the Fourth Edition.

PPD Benefit Formulas

Colorado PPD benefits are paid by two methods, depending on the permanently impaired body part. "Scheduled" injuries include arms, legs, eyes, and ears. Exceptions to this are 100% loss of or loss of use of the major portions of the extremities. Those injuries are paid using the "whole person" method. The scheduled injuries are paid based on the number of weeks assigned to that body part in the Colorado statute multiplied times the physician's % rating of the extremity and the weekly payment rate set in the statute. That is: Scheduled benefit = number of benefit weeks x % rating x weekly rate. The rate of the weekly payment for scheduled injuries is also assigned by statute. It was \$150 for many years, but in July 1999 the weekly rate was increased to \$176 per week, and starting in July 2000, it was required by statute to change by the same percentage as the state average weekly wage. Thus, each year from 1999 forward has a different weekly payment rate.

Injuries that are not included in the schedule are paid under the "whole person" method. For example, any injury involving the spine, internal organs, or psychiatric impairment is calculated using the whole person formula. This formula is also found in statute. It is the physician's impairment rating of the whole person multiplied times a statutory age factor times the number 400 times the worker's temporary total disability (TTD) weekly payment rate. That is: Whole Person benefit = 400 weeks x % rating x age factor x TTD weekly payment rate. The age factor varies from 1.8 to 1.0, with workers 20 years old or younger receiving 1.8, those 60 years old or older receiving 1.0. In Colorado, the TTD rate is 66 2/3 percent of the injured worker's average weekly wage, up to a maximum of 91% of the state average weekly wage.

Sampling

The sampling frame was the set of PPD claims that were considered to have closed in the fiscal years 2000 and 2001 with dates of injury on or after July 1, 1991. July 1, 1991 was the effective date of Senate Bill 218 (SB218), which extensively restructured PPD benefits and other areas of Colorado Workers' Compensation law. These claims were identified from the 2000 and 2001 closed

claims studies. (See Appendix B for a description of the Closed Claim Studies.) The closed claim cases are identified using among other information, the admissions for PPD benefits that are required to be reported to the DOWC. These admissions contain the physician's impairment rating, part of body and the amount paid (or due to be paid) for the PPD benefit.

There were a total of 21,116 PPD claims for the two closed-claim studies, with 257 claims appearing in both 2000 and 2001 for a total of 20,859 unique claims. Two hundred twenty-seven claims had dates of injury before July 1, 1991, leaving 20,632 unique, post-SB218 PPD cases.

These PPD cases were categorized according to information on the Division of Workers' Compensation database. The database has an indicator identifying how a PPD injury was paid, either as whole person or scheduled. Cases were divided into three categories using this indicator. Using the means and variances from the impairment ratings in the closed claim studies, forty upper extremity cases, 60 lower extremity cases, and 150 whole person cases were estimated to be needed in order to have adequate confidence in the final results. A larger representation of lower extremity and whole person cases was chosen since the changes in the impairment rating systems between editions was greatest for these two injury types. Additionally, whole person cases incur significantly greater system costs than extremity cases.

There were 7,964 whole person claims in the file of closed claims. The 12,668 scheduled cases were further divided according to body part rated. If the arm or part of arm was rated, the case was included as an upper extremity case. If the leg or part of leg was rated, the case was included as a lower extremity case. Next, 524 upper extremity cases that paid a benefit for part of a hand and 38 lower extremity cases that paid a benefit for part of a foot were removed from the sample pool. These 562 "minor" extremity cases were excluded because their combined costs are less than 1.5% of the total cost of the remaining scheduled cases, so any *differences* in the ratings using the three editions of the *Guides* would have a negligible effect on total costs differences.

In addition, 135 scheduled injuries with eyes or ears rated were excluded from the study for the same reason. These claims make up about 1% of the number and cost of scheduled PPD claims, and only 0.7% of all PPD claims or 0.3% of the cost of all PPD claims.

Thus, starting with a two-year pool of 20,632 unique, post-218 closed PPD claims, and excluding several sets of claims whose cost impact would be negligible regardless of the edition of the *AMA Guides* used to rate them, the

resulting sample pool of 19,935 PPD cases used for this study was distributed as follows: 7,964 whole person, 7,664 upper extremity, and 4,307 lower extremity.

Scheduled Sampling Stratification

Stratifications were created within each broad category in order to assure that some cases were included across the entire spectrum of impairment ratings, and that cases of a type that contributed more to the overall costs were sampled more heavily. The problem with using the impairment rating itself for stratifying scheduled injuries is that different body parts are being rated. Because the lowest common denominator between scheduled injuries is benefit weeks, this was the factor used for stratifying. Strata are also reported in terms of cost intervals. These were created simply by multiplying benefit weeks by \$150 per week, the weekly rate that had been in effect for years.

To be included in the sample pool, the difference between our calculated benefit amount and the reported paid benefit according to our computer database was required to be one dollar or less. This was intended to eliminate spurious cases, simplifying the manual-screening phase. One potentially significant set of claims, in terms of cost impact, eliminated by this procedure were cases shown on the most recent admission as PPD scheduled arm-at-the shoulder with one percent impairment, but which had benefit-amount discrepancies greater than one dollar due to a variety of factors, including an incorrect impairment rating, the misclassification of a whole person injury, or a stipulated settlement that closed the case. An analysis of these 128 cases suggested they would contribute about \$1.1M in additional PPD costs, distributed across scheduled and whole person cases, beyond the estimated costs reported later in this study. (See Appendix C for a summary of this analysis.)

In 9,751 (81%) of the 11,971 scheduled cases, the calculated benefit differed by a dollar or less from the paid. Three hundred twenty cases were identified where the paid amount was calculated using a weekly rate corresponding to the wrong year. These cases were included in the sample pool using the calculated benefit weeks to stratify. Another 504 cases were identified where hands or feet were the injured body parts, but the paid amount was calculated using the stated impairment rating with the benefit weeks corresponding to arms or legs. It is likely that these cases would have been paid at the arm or leg no matter which edition of the *AMA Guides* was used, so the calculated benefit weeks was changed accordingly, and these cases were also included in the pool. The total acceptance rate in the scheduled injuries sampling pool to this point, including the two categories discussed above, was 88% (10,530 of 11,971).

As a first cut, benefit week intervals of 10.4 weeks (5% of the maximum scheduled benefit weeks) in width were defined. The number of scheduled injury cases selected for the study within each interval was proportional to the total dollar cost incurred in that category using the standardized rate of \$150. Results are shown for upper extremity in Table 1 and for lower extremity in Table 2. For both upper and lower extremities, all categories with PPD payments greater than \$7800 dollars were collapsed into one category in order to have enough sample cases for that stratum. Cases with PPD payments less than \$1560 dollars only accounted for 2.4% of the total lower extremity costs and would have included only one case in the sample, so this stratum was eliminated from the study (See Table 2).

Table 1. Upper Extremity Stratification

Collapsed categories	Benefit weeks	Based on \$150/wk	Count	\$	Count %	\$ %	Sample Size
1	< 10.4	\$0 to < \$1560	2252	\$1,743,456	34.1%	9.5%	4
2	< 20.8	\$1560 to < \$3120	1981	\$4,095,624	30.0%	22.4%	9
3	< 31.2	\$3120 to < \$4680	1273	\$4,577,976	19.3%	25.1%	10
4	< 41.6	\$4680 to < \$6240	478	\$2,465,736	7.2%	13.5%	5
5	< 52	\$6240 to < \$7800	310	\$2,083,380	4.7%	11.4%	5
6	<= 208	>=\$7800	314	\$3,306,732	4.8%	18.1%	7
Total			6608	\$18,272,904	100%	100%	40

Table 2. Lower Extremity Stratification

Collapsed categories	Benefit weeks	Based on \$150/wk	Count	\$	Count %	\$ %	Sample Size
1	< 10.4	0 to < \$1560	417	\$394,056	10.6%	2.4%	0
2	< 20.8	\$1560 to < \$3120		\$2,143,128	26.0%	13.3%	9
3	< 31.2	\$3120 to < \$4680	1034	\$3,703,440	26.4%	23.0%	14
4	< 41.6	\$4680 to < \$6240	673	\$3,449,316	17.2%	21.4%	13
5	< 52	\$6240 to < \$7800	383	\$2,578,680	9.8%	16.0%	10
6	<= 208	>=\$7800	395	\$3,867,240	10.1%	24.0%	14
Total			3922	\$16,135,860	100%	100%	60

Whole Person Sampling Stratification

Stratifications were also created for whole person injuries to assure adequate sampling across the range of impairments and to best estimate costs. Because Whole Person benefits are paid on both medical and non-medical criteria, such as age and salary, the sampling for Whole Person cases used percentage points of

impairment to determine strata and sample sizes. As a first cut at stratifying whole person cases, a strata width of 5% impairment was used. The number of whole person injury cases selected for the study within each stratum was proportional to the total impairment points incurred in that category. Because too few cases were in the upper strata for adequate power, the 40%-45% and 45%-50% categories were combined, as were the remaining higher categories, forming a 40%-50% category and a 50%-100% category. The total costs for each stratum were calculated using the age and average weekly wage of the actual cases. Results are shown in Table 3.

Table 3. Whole Person Stratification

Category	Impairment Rating %	Count	Sum of Impairment Rating %	Percent of Impairment Rating %	Sample Size
1	0 to < 5	550	1,490	1.3%	2
2	5 to < 10	1,815	13,005	11.0%	17
3	10 to < 15	2,154	26,326	22.2%	33
4	15 to < 20	1,712	29,049	24.5%	36
5	20 to < 25	892	20,077	17.0%	26
6	25 to < 30	394	10,633	9.0%	13
7	30 to < 35	220	7,170	6.1%	9
8	35 to < 40	97	3,604	3.0%	5
9	40 to < 50	77	3,442	2.9%	5
10	50 to 100	53	3,625	3.1%	4
Total		7,964	118,421	100%	150

Random Sampling

A random sample was drawn independently from each stratum. More cases than required by the study design were randomly chosen from each stratum in order to have replacements readily available for cases that were eliminated during manual screening. The randomly selected sample cases were randomly ordered within each stratum for manual screening. The DOWC screener proceeded down the list until the assigned number of cases for each stratum was identified.

Screening

A Division of Workers' Compensation staff member, who is a registered nurse, reviewed the division's case files of the randomly selected cases to determine their adequacy for the study. Generally, the case files can be expected to contain a Final Admission giving the impairment rating and other relevant information used to calculate PPD benefits, and one or more medical reports documenting the basis

for the impairment rating and the details of its calculation. Cases that failed to meet specified criteria were rejected. (See Appendix D for the checklist of screening criteria used by the staff reviewer.) The most important criteria included the following: Only cases with medical information adequate for a third party to calculate ratings under all three editions of the *AMA Guides* were included. Cases were also rejected if they had been misclassified in the Division of Workers' Compensation administrative database, e.g., an extremity injury classified as whole person, or a lower extremity classified as an upper extremity. And finally, cases that included a psychological rating were excluded from the samples since there is no numerical system for rating psychological impairment in any of the *AMA Guides*.

As shown in Table 4, 115 cases or about 32% of the 365 cases reviewed were rejected. Cases that were missing essential information accounted for the largest number of rejections. In 71 cases, or 62% of the total rejections, the division's case file was missing essential information, such as a Range of Motion (ROM) assessment, an impairment rating, or a medical narrative needed by the reviewer to independently rate the case, or the file was missing a final admission, making it impossible to verify key pieces of information about the case. "Misclassification" was the second general reason for the rejection of cases. This involved cases where the medical report and the division's database differed with regard to crucial details about the injury, such as the medical report showing an upper extremity rating while the database indicated it was lower extremity, or vice versa, or the database indicating a whole person injury that turned out to be an extremity injury. Such discrepancies accounted for 10 or about 9% of the case rejections. Four cases had a psychological rating, either exclusively or in combination with an extremity rating, and were rejected because, as noted above, none of the editions of the *AMA Guides* has a numerical system for rating psychological impairments. Sixteen cases or about 14% of the total were rejected for "other" reasons, which included ratings for multiple injuries, with reports by two different physicians, at least one of which was incomplete, or a large discrepancy between the impairment rating in the medical report and the division's database. Cases that passed the DOWC's screening were then forwarded to the expert reviewer, who also screened them. Another 14 cases, or about 12% of the total, were rejected because, in the judgment of the expert reviewer, the information in the medical report, though adequate to rate the case using the Third Edition revised, was inadequate for use with the Fourth or Fifth Editions. (See Appendix E for additional details regarding the rejected cases.)

Table 4. Reasons for Rejection

Reason for Rejection	Count of Cases				Percent of Cases			
	Upper Scheduled	Lower Scheduled	Whole Person	Totals	Upper Scheduled	Lower Scheduled	Whole Person	Totals
Screening by DOWC Staff:								
Case File Missing Essential Information								
No Range of Motion (ROM)	7	4	35	46	11.7%	5.2%	15.4%	12.6%
No impairment rating in file	3	3	4	10	5.0%	3.9%	1.8%	2.7%
No medical narrative in file	0	2	5	7	0.0%	2.6%	2.2%	1.9%
No diagnosis or incomplete narrative	2	3	0	5	3.3%	3.9%	0.0%	1.4%
No Final Admission (FA)	0	0	3	3	0.0%	0.0%	1.3%	0.8%
Case Misclassified								
Lower not Upper	4	0	0	4	6.7%	0.0%	0.0%	1.1%
Upper not Lower	0	2	0	2	0.0%	2.6%	0.0%	0.5%
Extremity paid as Whole Person by Carrier	0	0	4	4	0.0%	0.0%	1.8%	1.1%
Case Whole Person Due to Psychological Rating								
Extremity + Psych paid as Whole Person	0	0	2	2	0.0%	0.0%	0.9%	0.5%
Psychological impairment only	0	0	2	2	0.0%	0.0%	0.9%	0.5%
Other								
Other	1	2	13	16	1.7%	2.6%	5.7%	4.4%
Screening by Expert Reviewer:								
Case Data Inadequate to Rate with 4th or 5th Editions	3	1	10	14	5.0%	1.3%	4.4%	3.8%
Totals:								
Total Cases Rejected	20	17	78	115	33.3%	22.1%	34.2%	31.5%
Total Cases Accepted	40	60	150	250	66.7%	77.9%	65.8%	68.5%
Total Cases Reviewed	60	77	228	365	100.0%	100.0%	100.0%	100.0%

Category Case Descriptions

Of the 150 sample whole person cases, 107 consisted of spine only, while 14 had no spine involvement. Some randomly selected whole person cases were rejected on the basis of consisting only of an extremity and/or psychiatric rating, but there were three cases that were included in the whole person sample that consisted of an extremity and a psychiatric rating only, and one case that consisted only of an extremity rating. These had in reality been paid as whole person benefits, and so were rated at the whole person level and estimated as paid using this method in the cost estimates for each edition.

The 40 upper extremity sample cases included 28 cases that were rated and paid as a single arm and 6 cases rated as bilateral cases with impairment being added and admitted for on one benefit line. Three cases were rated at hand, two at thumb, and one at ring finger, all paid at the arm.

The 60 lower extremity sample cases included only one case rated and paid at the foot. All the remaining were rated and paid at the leg.

All categories had a few payment irregularities or discrepancies reported in the DOWC database due to the misclassifications described above. Although four cases were rejected because of incorrect rating, two cases made it into the sample where the impairment rating on the admission differed by more than one point from that on the doctor's report. One was rated whole person, the other was rated as a lower extremity case. Additionally, the upper extremity group had a case that was rated at the thumb (31%) and paid at 31% of the arm.

Interrater Reliability

The interrater reliability between the expert rater and the Medical Director of DOWC, who is also an authority in the use of the *AMA Guides*, was calculated from an independent review of 20% of the total sample selected at random: 28 whole person, 12 lower extremity, and 7 upper extremity cases (see Rosner 1995, for a discussion of the method used). The results are shown in Table 5. In general, the intraclass correlation coefficients were near or above .9, indicating high interrater reliability for all three editions for most types of cases. The notable exception was the low interrater reliability for whole person cases for the Fourth Edition, with an intraclass correlation coefficient of .583.

Interrater reliability ratings are often used to test the reproducibility of diagnostic and psychometric measures for use in assessment of patients and other populations. The interrater reliability measures here do not purport to test the overall applicability or validity of the *Guides* to injured workers, nor to suggest that all physicians using the *Guides* would reach the level of agreement of these two experts. The reliability was further improved by both raters relying on the Colorado accreditation curriculum and Rule XIX. Further, the raters did consult

when the interpretation of these Colorado rules were not clear to the expert. However, the differences found in reproducibility between editions of the *Guides* may be related to clarity, simplicity of method, or room for interpretation allowed by the different *Guides*. This result suggests much greater disparity among physicians in impairment ratings if the Fourth Edition were to be adopted in Colorado. The costs associated with disputes or litigation resulting from the potential variability of the Fourth Edition have *not* been included in the estimates reported in this study.

Table 5. Interrater Reliability: Intraclass Correlation Coefficients

Source	3 rd Revised	4 th	5 th
Upper extremity	.996	.998	.893
Lower extremity	.919	.906	.906
Whole person	.972	.583*	.921

*Coefficient is 0.733 when an extreme outlier is excluded

See Appendix F for scatter plots of the correlation between the whole person ratings by the expert reviewer and the DOWC Medical Director for each of the three editions of the *AMA Guides*. These graphs show that the disparity in ratings found using the Fourth Edition is not predictable; in some instances the Medical Director is higher and in other instances lower than the contract reviewer.

Calculating Cost Estimates

Payers report to the Division of Workers' Compensation the PPD dollar amount owed an injured worker on a form called an "admission". Where calculated benefits match paid benefits from the admission, and there were no discrepancies between doctor's narrative impairment rating report and the admission, it is a straightforward matter to calculate the benefit amounts under the Third, Fourth, and Fifth Editions as reviewed by the contractor. For those cases with discrepant reporting, the appropriate amounts for a cost impact estimate using the Third, Fourth, and Fifth Editions becomes more difficult to calculate. In order to standardize and simplify the treatment of these cases, benefit amounts for the sample of scheduled cases were calculated using the body part and the weekly rate for the fiscal year of injury listed on the admission. The impairment rating from the expert reviewer for each edition was calculated at the level of the body part on the admission. For example, if the injury was rated at the hand, but the admission was paid for the arm at the shoulder, then our study based the cost impact on the payment that would have been made based on the arm at the shoulder using the expert's ratings from the different editions of the *Guides*. For

whole person sample cases, temporary total disability rates were calculated from average weekly wages. These rates were used with the age factors from PPD benefit lines on the admissions and the expert's impairment ratings for each edition to calculate benefit amounts for each edition. The average benefit amount per case at each strata for each edition was multiplied times the population number of cases found in that strata. The total amounts for each strata were then added to derive total PPD costs per category for each edition. Differences in benefit amounts were then calculated between the Third Edition revised and the Fourth and Fifth Editions. Estimates of the total cost differences, their variances, and the confidence intervals for the sample strata were calculated using standard methods for analysis of stratified samples (Lohr, 1999). This method requires population counts in each stratum and from this estimates population totals. All but pre-SB218 cases were included in population counts. For whole person cases, this corresponds to all cases in the sample pool. For scheduled cases, this includes all cases in the sample pool, and additionally, those cases that were excluded from the sample pool solely because of non-matching paid and calculated benefits. The results, then, are estimates for applying the different versions of the *Guides* to all post-SB218 cases that closed in the two-year period, regardless of date of injury.

RESULTS

Results are shown in Table 6 and 7. (See Appendix G for detailed cost estimates, including confidence intervals, from which Tables 6 and 7 are derived.)

Table 6 presents the total annual cost estimates for the calculated PPD amount from the DOWC admission document and the annual cost estimates using the expert reviewer's ratings for the three editions, divided into the Whole Person, Upper, and Lower Extremity, as well as the Total estimated annual PPD costs.

Table 6. Estimated Annual PPD Costs in Millions of Dollars

Source	Whole Person Est. Cost	Upper Extremity Est. Cost	Lower Extremity Est. Cost	Total Estimated Cost
Calculated Admission	102.69 M	11.69 M	9.64 M	124.02 M
Reviewer 3rd Edition	99.51 M	9.44 M	9.46 M	118.41 M
Reviewer 4th Edition	59.16 M	8.64 M	7.13 M	74.92 M
Reviewer 5th Edition	71.95 M	8.67 M	7.13 M	87.75 M

Table 7 presents the estimated annual differences in cost between the Third Edition Revised and the Fourth Edition, and also between the Third Edition Revised and the Fifth Edition.

Table 7. Estimated Annual Difference in PPD Costs in Millions of Dollars

Source	3rd cost minus 4th cost*	3rd cost minus 5th cost
Whole Person	40.35 M*	27.56 M
Upper Extremity	0.80 M	0.76 M
Lower Extremity	2.33 M	2.33 M
Total	43.48 M*	30.66 M

*Concerns regarding the reliability of the starred estimates are discussed below & in the "Interrater Reliability" section of this report.

It is important to keep in mind that the confidence in the Fourth Edition cost estimate is much less than the confidence in the Fifth Edition, because the interrater reliability between the two experts was much lower for the Fourth Edition whole person ratings (see Table 5, above). Additionally, the Fourth Edition calls for rating spine injuries at the time of injury without allowing for

improvements after healing has occurred. This study by necessity used medical records at the time of MMI. Therefore, the estimated ratings using the Fourth Edition are lower than if these directions could have been followed.

The estimated reduction in cost in the workers' compensation system in Colorado using the Fifth Edition instead of the Third Edition Revised during one year of permanent partial benefit payments is approximately \$ 30.7 million. The study reached this estimation with a 95% confidence interval of \$24.4 million to \$37 million. The size of the confidence interval reflects only the amount of variability in the types and severity of injuries in the Colorado system as rated by one doctor. It does not include the additional variation that occurs with multiple raters. Given the high interrater reliability coefficient for the Fifth Edition, the additional variability due to multiple trained physicians should be reasonably small, but this confidence interval is likely conservative.

The estimated reduction in cost between using the Fourth Edition instead of the Third Revised Edition during one year of permanent partial benefit payments is perhaps \$43.5 million. The confidence interval is *at least* as large as for the Fourth Edition, but is not reported because the interrater reliability for whole person injuries using the Fourth Edition was very low. Additional concerns about the validity of the Fourth Edition spine impairment cost estimate are based on the fact that the medical records reviewed by the expert rater were filed at the time of Maximum Medical Improvement, rather than at the time of injury, as called for in the spine chapter of the Fourth Edition. The apparent spinal impairment differences between the Fourth Edition and the other editions are exaggerated by this departure from the Fourth Edition methodology; if the Fourth Edition methods had been followed for the spine cases, the spine ratings would be higher and the cost differences less than estimated here.

DISCUSSION

The purpose of the present study was to estimate the change in PPD compensation payments that may be expected if the Colorado statute were to mandate the use of another edition of the *Guides* in lieu of the Third Edition Revised. Lack of information concerning the consequences of adopting newer editions of the *Guides* prompted interest in conducting a simulated situation in which a sample of workers recently compensated in Colorado would have their impairment ratings assigned under three editions of the *Guides*: the Third Revised, the Fourth, and the Fifth. An authority on the *Guides* was contracted to review the medical records of 250 workers with permanent partial impairments and assign ratings under the criteria used by the different editions. The *AMA Guides to the Evaluation of Permanent Impairment* has come under criticism in the past for setting poorly reproducible criteria for the rating of permanent impairment (Spieler et al 2000). Therefore, the Colorado DOWC has created interpretive assistance for its accredited physicians, in order to increase consistency in their use of the Third Edition Revised. Additionally, in order to measure agreement between raters in this study, the Medical Director of the Colorado Division of Workers' Compensation, also an authority on the use of the *Guides*, reviewed 20 percent of the records examined by the contracted expert. In our study, the expert physician used the provisions found in the Colorado Accreditation Manual and Rule XIX to formulate ratings; this would be expected to improve the consistency of his ratings with those likely to be assigned by a Colorado accredited physician. The expert physician and the Colorado Medical Director conferred by telephone numerous times to reach agreement regarding principles of interpretation and application of the *Guides* (refer to Appendix A for these agreements). This also would make the consistency of their ratings greater than that which would otherwise occur. If a newer edition of the *Guides* is adopted, the DOWC hopes to incorporate these interpretations, where appropriate, for all Colorado Accredited physicians. The resulting calculated interrater reliability in this study was very high in the Third, Fourth, and Fifth Editions for scheduled injuries, and was also very high in the Third and Fifth Editions for whole person ratings. However, the interrater reliability was significantly lower for whole person ratings in the Fourth Edition, possibly due to the fact that more than 90 percent of the whole person cases involve spinal ratings, where the spinal chapter of the Fourth Edition presents problems in arriving at consistent ratings. Oklahoma's Physicians Advisory Committee rejected the 4th Edition on January 21, 1994, due to the lack of validity and the cumbersome nature of the spine section. This lack of agreement among raters could lead to increased litigation and makes it difficult to accurately estimate the mean cost impact of Colorado's changing to the Fourth Edition. Additionally, given the direction of the difference in ratings between the study expert and the original rating physicians, along with the possibility of increased legal fees, the actual cost impact using the Fourth Edition is probably underestimated in this study.

The stability of impairment rating across successive editions of the *Guides* has not been well studied. A thorough MEDLINE search of the published medical literature has not revealed any systematic study which addresses the changes in impairment ratings associated with differences in evaluation methods prescribed by different editions of the *Guides*. A mail survey of state Workers' Compensation systems conducted by the Research and Statistics Unit of the Colorado Division of Workers' Compensation revealed that while many states have changed their statutory requirements from the use of earlier editions to the use of later editions of the *Guides*, no state reported having measured cost differences in compensation payments associated with changing editions.

The intent stated in the introduction of each edition should also be considered before statutory adoption. Chapter one of the Fourth Edition explicitly states in bold type on page 5: **“It must be emphasized and clearly understood that impairment percentages derived according to the *Guides* criteria should not be used to make direct financial awards or direct estimates of disabilities.”** There is a comparable statement in the Fifth Edition on page 13: **“Impairment percentages derived from the *Guide’s* criteria should not be used as direct estimates of disability. Impairment percentages estimate the extent of the impairment on whole person functioning, and account for basic activities of daily living, not including work. The complexity of work activities requires individual analysis. The impairment assessment is a necessary *first step* for determining disability.”** The Fifth Edition is supportive of the calculation of impairment as part of determining disability. It should also be noted that a constitutional challenge to the *Guides* was rejected by the Texas Supreme Court in 1995 (*Texas Workers' Compensation Commission v. Garcia*, 893 S.W. 2d 504, 524), which ruled that while imperfect, the *Guides* did not violate the equal protection clause of the Constitution (Babitsky et al., 2002:44).

Results from the sample selected for comparison in the present study suggest that annual PPD costs could be expected to decrease by approximately \$ 30.7 million if the Fifth Edition were adopted in place of the Third Edition, Revised. The cost difference for the Fourth Edition was estimated to be approximately \$ 43.5 million, however, as noted above, this estimate is likely to be both too low and not satisfactorily reliable. Not reliable, because the interrater reliability was low both in this and earlier studies. (Oklahoma Physicians Advisory Committee findings, 1994). Low, because the study ratings had to be done using the medical narrative at Maximum Medical Improvement, instead of at the time of injury as the Fourth Edition directs. For example, radicular findings present at the time of injury are incorporated into the final impairment rating, even if they resolve with treatment. This feature certainly would add significantly to the cost of implementing the Fourth Edition, in a way that was not possible for this study to estimate, and it may conflict with the intent of the Colorado statute. Additionally, there are expected litigation costs associated with the use of the less reliable *Guides* Fourth Edition. These litigation costs were also not included in this study.

Other Costs

Adopting a newer edition of the AMA *Guides* has other cost implications which could not be quantified in this study but which will impact ultimate costs. For all these, the costs associated with the Fifth Edition would be less than those for the Fourth. Some costs will be required of the DOWC if either updated edition is adopted. These include such costs as training the accredited physicians in the use of a new methodology for rating impairment, enforcement of the accuracy of the impairment ratings provided by accredited physicians, and assuring a supply for Colorado physicians of copies of the adopted *Guides* edition.

There will be a training expense whether the Fourth or Fifth Edition is adopted. All accredited physicians would be required to update their training through attending a seminar or some form of home study. The next series of re-accreditation courses will begin in 2004. The Division of Workers' Compensation Accreditation Unit creates a new program every three years for the re-accreditation courses. Therefore, it would not require significantly more effort to create a program around the Fifth Edition in 2004 than would normally be expended to create the re-accreditation curriculum for that year. There will be some additional expense because the accreditation manual will need to be extensively rewritten based on the Fifth Edition.

Many of the physicians who perform accreditation ratings for Colorado workers' compensation perform impairment ratings for other systems such as the federal government, and automobile and personal injury cases. Ratings for these other systems are performed using the Fifth Edition of the AMA *Guides*. Therefore Colorado physicians are already familiar with using the Fifth Edition. Having a parallel system using the Fourth Edition (which has a different system for considering spinal injuries) would be confusing and difficult to enforce. Currently, enforcement is done extensively through the DOWC's Independent Medical Exam unit, where all IME reports are reviewed and incomplete notices are sent when physicians do not follow impairment rating directions from the Third Revised Edition or the Division of Workers' Compensation. In addition, any complaints by parties that a Level II accredited treating physician or consultant physician has not followed the impairment rating guidelines are dealt with in a similar manner. Changing to the Fourth or Fifth Edition will increase the level of work in this area as physicians acquaint themselves with the new edition and new directions from the Division of Workers' Compensation. The increased need for enforcement might be much higher if the Fourth Edition were adopted since physicians are not currently using the Fourth Edition. Additionally, the increase in rating errors could likely lead to an increase in litigation and further incite the costly 'dueling doctors' syndrome within our administrative hearing process.

The adoption of the Fourth Edition would also lead to additional administrative costs for the DOWC Accreditation Program. Since the Fourth Edition is out of

print, the DOWC would need to secure the rights to having the book copied and printed by the AMA. This is the route that is currently used for the Third Revised Edition. It adds significant costs to the program. If the Fifth Edition were adopted, the physicians could be required to purchase the Fifth Edition, which many of them already own, rather than having the Division of Workers' Compensation be responsible for a reprint of the Fourth Edition.

Key Assumptions

This study assumed that the DOWC would continue to provide interpretation and guidance to the accredited physicians regarding whatever *Guides* edition is adopted. Although concerns regarding the reliability of the Fourth Edition have been documented earlier in this report, the Fifth Edition also contains several areas that would require definition by the Division to increase the reliability of ratings and decrease litigation. For instance, the Fifth Edition provides three methods for rating complex regional pain syndrome, previously known as reflex sympathetic dystrophy. Only one method should be available. The spinal rating system in the Fifth Edition is more specific and works better with our statute than the Fourth Edition. Both editions allow the injury or diagnosis/related estimates model (DRE) and the spinal range of motion model for some cases. The Fifth Edition provided some additional direction as to when the range of motion model should be used compared to the Fourth Edition. Our expert suggested that further definition be provided to physicians so that the range of motion model could only be used when there is a multi-level involvement in the same spine region, for instance, fractures, disc herniations with radiculopathy, or stenosis with radiculopathy. Another problem with both the Fourth and Fifth Editions is that the lower extremity rating system frequently allows three or four methods for rating any specific injury. It would be important that the Division establish a list of common lower extremity injuries and note which system should be used for their rating, rather than allowing physicians to debate between three or four areas of rating. The Fifth Edition also contains a chapter for rating chronic pain that would allow an additional one to three percent rating. It is a fairly complex evaluation system and due to our statutory requirements of rating pain only when there are anatomic and physiologic findings, the chronic pain chapter of the Fifth Edition could not be used in Colorado (Chronic pain was not used in the ratings generated in this study.) This would need to be clearly delineated to avoid any escalations of rating based on subjective pain concerns. Any confusion about how to rate a specific injury type among raters will clearly lead to increased litigation and uneven settlements between workers with the same injuries. Without continuing accreditation guidance through the curriculum and Rule XIX, costs of any change in the system cannot be reliably predicted.

The annualized cost differences calculated here estimate those that would arise if a newer edition of the *Guides* were implemented using the assumption that this would be a procedural change. If the statutory change were procedural, affecting all open PPD claims regardless of date of injury, the cost impact would be

relatively immediate. On the other hand, if the statutory change were substantive, affecting only claims with dates of injury on or after the effective date of the change in the statute, the full impact of the cost difference as estimated here would not be evident for several years.

Colorado's current system of psychiatric ratings was assumed to be continued whichever edition of the *Guides* is adopted for impairment ratings of physical injuries. This was assumed because none of these editions includes a numeric rating system for psychiatric impairments.

This study assumed that there would be no reduction in PPD claims, even though there is some evidence to suggest that reducing benefits results in a reduction in the number of workers' compensation claims. Generally, the research is based on regression analyses of increases in benefits with accompanying increases in claims, and is most often shown for temporary total disability benefits.

Limitations

A number of limitations occurred due to the use of an administrative database for the identification of and information on cases. For example, many randomly selected cases could not be used because the medical record adequate for admitting liability was not complete enough to generate impairment ratings using the Fourth or Fifth Edition. Additionally, cases that settled without ever admitting for PPD could not be included in this sample because there was no medical record in our files that could identify whether these cases had any impairment. The frequency with which such settlements are reached may be affected by the adoption of a different edition of the *Guides*, but no estimate of that frequency on cost differences is attempted here. Additionally, any reduction in settlement amounts that may occur with a change in *Guides* edition was not included in the cost impact of this study. The estimate was also limited by the misclassifications of cases caused by various errors in admissions and data entry into the database.

Because of the difficulty in determining multiple injuries given the technical requirements of our admission process and the structure of our database, cases with multiple injuries, some of which were Scheduled and some Whole Person, were cost estimated only under one type of injury. Two of the 150 cases analyzed as whole person cases had scheduled impairments in addition to the whole person ratings; this study did not consider the additional system costs associated with the co-existing scheduled rating and therefore may have underestimated the costs of the Third Edition Revised.

Finally, any research design is limited in how accurately it can use a sample to predict what will happen in an entire population. The cost differences reported in this study are estimates of annual cost differences that might be seen if newer editions of the *Guides* were adopted in Colorado. Three distinct sources of uncertainty are relevant. The first is sampling error, arising from the selection of

250 cases from a population of nearly 20,000 workers who received PPD impairment ratings during the two-year sampling pool used in this study. This uncertainty is reported in the confidence intervals for cost differences given in the body of the report. The second source of uncertainty arises from the interrater reliability issues reported and discussed above; this uncertainty is especially relevant to the spine ratings of the 4th edition. The third source, in contrast to the two others, cannot be estimated numerically based on the information available. The various editions of the Guides were applied to case records by expert authorities in their use; both the contracted rater and the DOWC Medical Director have used and taught the use of the AMA Guides for a number of years. When Colorado physicians begin to apply the Guides following brief DOWC Level II Accreditation trainings, they will bring less experience and expertise to the cases they evaluate. Past experience has shown that Level II physicians sometimes apply the Guides in ways that are not consistent with the Accreditation training. Additional training seminars may reduce, but will not eliminate, this practice variation. The interrater reliability results suggest that physicians can be trained toward increasing accuracy with the use of the Fifth Edition, but that due to the lack of expert agreement on application of the spine chapter of the Fourth Edition, there might not be a clear goal toward which they could be trained.

Conclusion

PPD compensation costs would be expected to decrease from current Third Edition levels following the adoption of a more recent edition of the AMA Guides. Cost differences are more predictable for the Fifth than for the Fourth Edition, and associated litigation and implementation costs are likely to be lower for the Fifth than for the Fourth Edition. These cost differences are assumed in this study to be effective as of the date of any statutory change in the Colorado Workers' Compensation statute. If changing to a newer *Guides* edition were determined to be a substantive change and therefore dependent on the date of injury, the cost decrease would occur gradually over a period of years. In either case, the expected decrease relies heavily on continued oversight, guidance and interpretation from the Division's medical programs.

Appendix A:

Instructions Given to AMA Guides Expert During Case Review

1. Create the impairment ratings in accordance with the Colorado regulations and the Accreditation Curriculum as shown in Rule XIX, and in the Colorado Impairment Rating Directions. (See Attachment, “Colorado Impairment Rating Directions”.)
2. AMA Guides Expert will reject cases, which in his judgment contain insufficient information to reliably rate the case within 5% points of a “correct” rating using the 4th and 5th editions of the AMA Guides.
3. Division Independent Medical Examination (DIME) reports will be held to higher standard regarding a complete history of the injury. The treating physician has frequently already provided information in other reports in his records regarding the treatment history and the causal relationship of the diagnosis, whereas the DIME physicians need to obtain this information from the injured worker at the time of the IME.
4. Apply the CTD rating criteria as outlined in the Division’s Medical Treatment Guidelines (MTG’s) and Rule XIX to a rating from any edition.
5. The lower extremity section methodology in the 4th and 5th editions of the AMA Guides is very different that the 3rd revised edition of the AMA Guides. Therefore, the necessary information may not be clearly delineated in the physician’s reports, as such; the AMA Guides Expert will use his best clinical judgment in evaluating the information in the lower extremity reports applying requirement #2.
6. Ligament tears under the 4th and 5th editions of the AMA Guides “minimal laxity” is assumed, unless the physician’s report specifies differently for lower extremity cases.
7. Range of Motion (ROM) cannot be apportioned unless there are previous ROM numbers to apportion the difference.
8. If the patient qualifies for a rating under the table for pelvic injuries 3.4 in the 3rd revised addition no additional ROM is combined.
9. Physical Therapist measurement for ROM can be used in the rating.
10. AMA Guides Expert’s narrative report will include his medical assumptions as well as his interpretative assumptions of each edition of the AMA Guides.

Attachment to Appendix A:

Colorado Impairment Rating Directions

Please review the following impairment rating directions when assigning impairment ratings:

- Lumbar Flexion Impairment:** When using Table 60, you must reference the sacral flexion angle first (1st column), then the true lumbar flexion angle to calculate the impairment percentage for true lumbar flexion (*Reference: Table 60, pg. 98, AMA Guides, 3rd Edition (revised)*).
- Straight-Leg Raise Check (SLR) for invalidation of lumbar flexion:**
**The SLR check applies to lumbar flexion only.* Of the SLR measurements for each leg, the evaluator records the MAXIMUM SLR for each leg. It is then the 'tightest' or the 'lowest' of these two maximum measurements for the right and left leg which is used to compare to the sum of sacral flexion and extension (*Reference: Level II Accreditation Curriculum, Range of Motion Testing for the Spine*).
- Invalidation of Spinal Range of Motion (cervical, thoracic, lumbar):**
To invalidate spinal range of motion impairment, claimants need to have two visits. Two sets of three measurements must be taken on each visit (12 measurements total). An IME may also use invalidated measurements from other reports. (*Reference: Level II Accreditation Curriculum, Range of Motion Testing for the Spine*)
- Angle of Minimum Kyphosis, Thoracic Flexion Worksheet:** Angle of minimum kyphosis must be recorded in addition to the other measurements. This is because it is the GREATER of the two impairments (between thoracic flexion and angle of minimum kyphosis) which is used in the rating (*Reference: Section 3.3d, pg. 91, AMA Guides, 3rd Edition (revised)*).
- Table 53:** The patient must have pathology and impairment identified in Table 53 to qualify for a spinal rating. If a Table 53 rating is used, spinal range of motion must be completed and applied to the rating (*Reference: Level II Accreditation Curriculum, Spinal Impairment*).
- Disfigurement:** Physicians may, if they deem appropriate, give a rating for scars using the AMA Guides 3rd Edition (revised), even though there is an option for the claimant to go to an ALJ to request additional award. (*Reference: Level II Accreditation Curriculum, Dermatology, section on Disfigurement; Colorado Revised Statutes (C.R.S. §8-42-108)*).

7. **Age:** Because age is considered in the calculation of benefits which the injured worker will receive, there is no additional apportionment for age when awarding impairment ratings (*Reference: C.R.S. §8-42-107*).
8. **Complex Related Pain Syndrome (CRPS)-formerly known as Reflex Sympathetic Dystrophy:** The Division recommends using the spinal cord table (*Table 1, pg. 109, AMA Guides*) for determining impairment, however the peripheral nerve tables may be used if the evaluator deems them more appropriate (*Table 14, pg. 46; Table 51, pg. 77, Table 10 pg. 42, AMA Guides*). In unusual cases where severe vascular symptoms cause additional impairment of ADL's the physician may choose to combine additional impairment for the vascular tables. (*Table 52, pg. 79 and Table 16, pg. 47, AMA Guides*). Range of motion should not be used, as this would be accounted for in the neurologic portion of the rating.
9. **Worksheets:** Make sure to attach all related worksheets to the narrative report and include this information to all legally concerned parties. Remember that the Division requires the Lower Extremity and Mental Impairment forms created by the Division as well as the spinal and upper extremity forms found in the AMA Guides. If you need to send an addendum or a response to an incomplete notice, make sure you copy all parties.
10. **Table 54:** Although Tables 53 and 54 are mutually exclusive and cannot be used in the same rating (*Reference: Level II Accreditation Curriculum, Spine/Lower Extremity, Diagnosis-Related Factors and pg. 81 AMA Guides*), remember that in some cases with ankylosis as a pre-existing condition Table 54 can be used for apportionment. In such cases, *Table 53* can be used for the current rating and *Table 54* can be used for the previous rating.
11. **Impairment ratings based on objective pathology:** Impairment ratings should only be given when a specific diagnosis and objective pathology can be identified. (*Reference: C.R.S. §8-42-107(8)(c)*) In cases with multiple symptoms, the clinician must determine whether separate diagnoses can be established which warrant an impairment rating or the impairment rating provided for a specific diagnosis incorporates the accompanying symptoms of the patient. This is particularly problematic in shoulder cases with accompanying neck pain. The clinician must determine whether an additional cervical pathology exists or the symptoms the patient has are those expected from the shoulder pathology of that patient.
12. **Shoulder surgery:** Resection arthroplasty referred to in the AMA Guides 3rd Edition Revised is to be used only for partial resection of the humeral head, a procedure rarely performed currently. Neither resection

nor implant arthroplasty values should be used for a distal clavicular resection. The value assigned to a distal clavicular arthroplasty is 10%. The AMA Guides 4th and 5th Editions continue to suggest that subacromial arthroplasty should be rated using ROM, and when appropriate, ‘joint crepitation with motion’ from the “Other Disorders” section. In general, when any additional rating for subacromial arthroplasty is deemed appropriate in a case with or without crepitus, it should not exceed 10%.

Appendix B:

The Closed Claim Studies

The PPD claims used in this study were drawn from the data sets created for the Closed Claim Studies of fiscal years 2000 and 2001. The Colorado Division of Insurance, with the assistance of the Division of Workers' Compensation, conducts a closed claim study each year for the purpose of identifying the cost drivers in the workers' compensation system. DOWC provides data sets of closed claims extracted from its database.

A "closed" claim is defined as one which had a final admission, fatal admission or final pay notice filed in the specified time frame, i.e., either FY 2000 or 2001, and which had no documents filed subsequently, such as an objection to the admission or an application for hearing, indicating that the claim might still be active. The closed-claim data sets extracted from the DOWC's database include both pre- and post-SB218 cases, claims with and without permanency, and, of those with permanency, both cases with permanent total and permanent partial disability.

The closed-claim data sets for fiscal years 2000 and 2001 were merged. If a claim appeared in both years, one of the two records was deleted. Then, the claims for present cost study were selected from this larger data set, using the criteria described in the body of this report, i.e., post-SB218 PPD whole-person and scheduled claims, excluding scheduled claims with ratings for eyes and ears. Finally, stratified samples were drawn, benefit amounts calculated, and cost estimates derived, as described in the body of this report.

The sampling frame drew claims from one of three categories, i.e., upper extremity, lower extremity, or whole person, based on an indicator of claim-type entered on the most recent final admission. This procedure did not allow for claims in the database that have multiple ratings and benefits paid for multiple injuries, such as two scheduled injuries, or a scheduled and whole person injury. No attempt was made in this study to estimate the number or cost impact of such claims.

Appendix C:

Analysis of PPD Cases with 1% Impairment/Body Part 1 (Arm at Shoulder)

An impairment rating and body part code are required to enter a line of scheduled PPD benefit into the Division's database. A line of scheduled PPD with an impairment of 1% and body part 1 (arm at the shoulder) is used sometimes to incorrectly "force" the data entry of an admission benefit line. We have attempted to quantify the impact of this practice without resorting to manually investigating hard files.

There were 352 cases with 1% at arm. In 203 of these cases, the benefit-line and calculated amounts matched, so these were probably bona fide cases. In 16 cases, the benefit-line amount matched the calculated amount using the incorrect year and another 5 matched using the hand. Thus, 224 cases or about 63% of the 352 were included in the sample pool because the benefit-line amounts either appeared to be correct or the discrepancies between the benefit-line and calculated amounts could be easily reconciled.

An analysis of the remaining 128 cases revealed a variety of conditions masked by the 1/1 coding. After examining some cases, one common occurrence was for an earlier admission to have a higher impairment rating at the arm that did correspond to the stated benefit amount. To attempt to automatically identify these cases, impairment ratings that corresponded to the statement payment amount were calculated. There were 41 instances of ratings that were integer amounts. A review of a sample of 18 of these produced the following results: Ten cases have a previous admission with a single scheduled PPD benefit line for body part 1 and a % that corresponds to stated payout amount. Six cases have a previous admission with two scheduled PPD lines. In four of these six cases, the ppd amount matches one of the two lines or the sum of both of them. In the other two cases, there is a higher impairment rating that does not correspond to stated payout amount. One case had whole person and scheduled PPD benefit line. One case looks like the rating should have been 2%. For the 16 cases in the first two categories, the stated amount is probably correct. Using this sample, we estimate that the actual amount exceeds the calculated amount by about \$98,000 distributed across scheduled strata.

Examination of other cases revealed that the PPD amount was actually a stipulation. The values of all stipulations found at random were a multiple of \$100. To identify these automatically, all stated PPD amounts that are multiples of \$100 were identified. There were 14 cases. One of these met the integer % criteria above, and looking at the Division database revealed a previous admission with a 25% @ arm, resulting in a multiple of a hundred benefit amount. 12 of the remaining 13 cases had amounts that matched those on the stipulated settlement screen. The last case was a scheduled PPD amount whose payment was cut short

by a stipulated settlement. The estimated additional contribution of the stipulated settlements is \$163,000.

Of the remaining 74 cases, 28 have a benefit-line amount greater than or equal to \$10,000. A sample of 19 reveals that 15 have a previous whole person admission where impairment rating, age, and ttd rate closely corresponds to stated benefit amount. Three cases had no previous admission on the database and one had a whole person and a scheduled benefit. It is likely that the first 15 cases are whole person cases with the correct amount stated on the benefit line. This results in an estimated \$520,000 extra in whole person of various impairments, and \$35,000 divided between whole person and scheduled cases. Assuming that the best estimate of dollars paid in the unknown cases is the stated amount, there would be another \$104,000 paid out for unknown benefits.

This leaves 46 cases of less than \$10,000 each that are unaccounted for. A sample of 13 shows five cases have a previous whole person admission that corresponds to stated payout amount, five cases have a previous scheduled admission that corresponds to stated payout amount, and three cases have no previous admissions. Projecting this sample results in an additional \$108,000 dollars, with about \$45,000 in each of whole person and scheduled cases and the remaining \$18,000 paid for unknown benefits.

The estimate of the total effect of the group of 128 cases not included in the sample pool is: \$132,000 in Scheduled benefits, \$560,000 in whole person, \$40,000 split between the two, \$163,000 in stipulated settlements, and \$140,000 in unknown benefits, for a total of \$1,040,000 extra benefits.

Results Outline

352 cases body part 1 % 1 (note: the following categories are almost mutually exclusive for this data set, exception is noted). Projections are made by simply scaling total counts and dollars proportional to sample counts. Probably a better way to project amounts would be to scale total amounts proportional to sample amounts, however, for the sake of simplicity, the former method was used for both counts and amounts.

203 match within \$1

16 match using a weekly rate corresponding to incorrect year

5 match using another body part

41 cases the % corresponding to payout amount stated is an integer.

A sample of 18 yields:

10 cases have a previous admission admitting for body part 1 but a % that corresponds to stated payout amount.

6 cases have previous admission with multiple scheduled PPD lines.

In four cases the payout corresponds to one of the two or to the sum of both lines. In the other two, the payouts are mismatched but the % is higher.

1 case had whole person and scheduled PPD

1 case looked like should have been 2%

For the 16 cases in the first two categories, ppdamt probably correct amount.

Projecting sample: Amounts to about \$98k more than calculated, distributed across scheduled strata.

14 cases (ppdamt multiple of \$100), includes 1 case integer %.

1 25% @ arm (already counted above in the group with 41 cases)

12 of them are Stipulations (\$4k less scheduled, \$163k extra in stipulated settlements)

1 was scheduled PPD cut short by stipulation (\$14k, placed in unknown)

27 cases \geq \$10k

A sample of 19 (only reviewing admissions on division data base) yields:

15 cases have a previous whole person admission that correspond to stated payout amount.

3 cases no previous admission

1 case had whole person and scheduled PPD

ppdamt probably correct amount. ~\$660k more than calculated.

Projecting sample: \$518k actually whole person of various %, another \$35k distributed between whole person and scheduled, and ~ \$104k unknown.

47 cases remaining

A sample of 12 (only reviewing admissions on division data base) yields:

5 cases have a previous whole person admission that correspond to stated payout amount.

5 cases have a previous scheduled admission that correspond to stated payout amount.

2 cases no previous admission

Projecting sample : Amounts to about \$109k, about \$45k in scheduled and the same in whole person, with the remaining \$18k unknown.

Appendix D:

Check List of Screening Criteria

File Review Data Collection Sheet

Upper/Lower Extremity Case Category _____

1. W/C# _____
2. Date of Injury _____
 - i. PPD Benefits Paid on selected FA case
 - a. FA Date _____ in computer.
 - b. FA in File _____. Matches Computer Y or N
 - c. DIME rating used on FA? - Yes or No
 - d. MMI Date on FA _____
 - e. PPD Benefits Calculated on FA _____
 - f. Impairment rating % _____ Extrem. in Computer.
 - g. Impairment Rating % on FA _____ Extrem.
 - i. Scheduled - Benefits paid at Body:
 - a. _____(R) or (L)
 - b. _____(R) or (L)
 - c. _____(R) or (L)
 - ii Body part injured:
_____ (R) or (L)

 - ii. Range of motion numbers included in narrative or worksheet? Yes ___ or No ____,
Not applicable _____.
 - h. Is there a later FA or Order listing this as a Permanent Total case? Yes _____ or No _____.
3. Was there a stipulated settlement? Y or N Date of Agreement _____
Was it after computer-used FA? Yes or No (circle one)
4. Was there an order changing selected FA with regard to ratings or PPD paid? Yes or No (circle one). If yes, what % change in (Impairment rating or PPD dollars) is there _____?
5. Attorney involvement _____ Yes or No _____. (Claimant or respondent or both)
6. Was the impairment rating used by the adjuster on the FA apportioned by the physician? Yes _____ or No _____.
7. Did the adjuster apportion the PPD dollars on the FA regardless whether the physician adjusted the rating or not? Yes ___ or No _____.
(Tell contractor to apportion the rating if answers to #7 is yes)

CASE NOTES:

Appendix D (con't):

Check List of Screening Criteria

CASE REJECTION CRITERIA SHEET

Upper/Lower Extremity Case Category _____

W/C # _____

Name _____

1. ___ No medical narrative in file
2. ___ No impairment rating in file - no FA and/or impairment narrative in file.
3. ___ No Range of Motion measurements in file
 - i. ___ Physician states in narrative ROM worksheets or measurements attached
 - ii. ___ Can not determine from physician's narrative if ROM completed or just not mentioned
4. ___ No diagnosis in file or unclear incomplete narrative
5. ___ PPD benefits are only for psychiatric impairment
6. ___ If selected as a whole person case, but contains only scheduled injuries.

Other: _____

Appendix D (con't):

Check List of Screening Criteria

File Review Data Collection Sheet
Whole Person - Case Category _____

1. W/C# _____
2. Date of Injury _____
 - i. PPD Benefits Paid on selected FA case
 - a. FA Date _____ in computer.
 - b. FA in File _____. Matches Computer Y or N
 - c. DIME rating used on FA? - Yes or No
 - d. MMI Date on FA _____
 - e. PPD Benefits Calculated on FA _____
 - f. Impairment rating % _____ WP in Computer.
 - g. Impairment Rating % on FA _____ WP
 - h. Age: _____
 - i. Whole Person Body parts:
 - a. _____ (R) or (L)
 - b. _____ (R) or (L)
 - c. _____ (R) or (L)
 - ii. Body part injured: _____ (R) or (L)
 - iii. Range of motion numbers included in narrative or worksheet? Yes ___ or No ___, Not applicable _____.
 - i. Is there a later FA or Order listing this as a Permanent Total case? Yes _____ or no _____.
3. Was there a stipulated settlement? Y or N Date of Agreement _____
Was it after computer-used FA? Yes or No (circle one)
4. Was there an order changing selected FA with regard to ratings or PPD paid? Yes or No (circle one). If yes, what % change in (Impairment rating or PPD dollars) is there _____?
5. Attorney involvement _____ Yes or No _____. (Claimant or respondent or both)
6. Was the impairment rating used by the adjuster on the FA apportioned by the physician? Yes _____ or No _____.
7. Did the adjuster apportion the PPD dollars on the FA regardless whether the physician adjusted the rating or not? Yes _____ or No _____.
(Tell contractor to apportion the rating if answers to #7 is yes)

CASE NOTES:

Appendix D (con't):

Check List of Screening Criteria

CASE REJECTION CRITERIA SHEET

Whole Person Category _____

W/C # _____

Name _____

1. ___ No medical narrative in file
2. ___ No impairment rating in file - no FA and/or impairment narrative in file.
3. ___ No Range of Motion measurements in file
 - i. ___ Physician states in narrative ROM worksheets or measurements attached
 - ii. ___ Can not determine from physician's narrative if ROM completed or just not mentioned
4. ___ No diagnosis in file or unclear incomplete narrative
5. ___ PPD benefits are only for psychiatric impairment
6. ___ If selected as a whole person case, but contains only scheduled injuries.

Other: _____

Appendix E:

Rejected Cases

Whenever cases must be rejected from a random sample, there is concern that bias has been introduced into the study. Therefore, the reasons for rejection were tracked in order to assess this possibility. Each case was screened first by a DOWC staff member, and, if judged acceptable, it was then forwarded to the expert reviewer for additional screening. (See Table 4, p. 9, for the distribution of rejected cases.)

The DOWC staff member, who is a registered nurse, assessed the completeness, accuracy and consistency of information in the case file and database. The files were first screened to ascertain whether they contained information sufficient to determine a rating. The Division files contain the Final Admission (FA) submitted by the payers that acknowledges liability. For PPD cases, the FA specifies the amount of the benefits owed the injured worker, along with the impairment rating and other relevant information upon which the benefits are based. A medical narrative accompanies the FA. Generally, the DOWC accepts these admissions if there is adequate documentation that the payer has relied on a physician's rating when it admits liability for PPD benefits. This may involve no more than the physician's statement of what the rating is, or it may involve a medical narrative detailing the basis for the rating, as well as the rating itself. Frequently, though, the narrative in the division's file lacks the medical information necessary to reconstruct the rating. Additionally, many of the closed claim files used in this study had already been scanned for long-term storage. The DOWC paper files are routinely culled prior to scanning. Some medical records will not be scanned if judged by DOWC not to be clearly connected to a final admission. Therefore, the rejection categories of "No Range of Motion (ROM)", "No impairment rating in file", "No diagnosis or incomplete narrative", and "No medical narrative in the file", all may reflect instances of these DOWC practices as opposed to any reporting or rating behavior of the physician. These categories account for 68 of the rejected cases. In addition, three files did not contain a FA, which meant that the impairment rating or other important details about the case could not be validated. Thus, 71 cases, or 62% of the 115 rejected cases, were rejected because the division's case file was missing essential information.

A second level of screening involved a comparison of case information in the division's file with that in the database. The study design attempted to balance two different distributions: that of impairment ratings within the three categories, and that of reported PPD payments. The randomly sampled stratifications were created using the information within the DOWC database, which relies on final admission (FA) documents. When the actual case files were reviewed, a comparison of details about the injury found in the medical report or FA and the

database revealed some significant discrepancies. In general, these discrepancies resulted in the misclassification of the case. For example, in four instances the database indicated the case was an upper extremity but the medical report or FA showed it was lower extremity, or vice versa in two cases. In four cases, the database indicated a whole person injury that turned out to be an extremity injury, which the payer had admitted as whole person. Thus, the categories of “Lower not Upper”, “Upper not Lower”, “Extremity paid as whole person” were used as rejection criteria. These misclassifications accounted for 10 rejected cases, or about 9% of the total cases that were rejected.

Additionally, cases with a psychiatric rating, either by itself or in combination with an extremity rating, were also rejected. In the past, Colorado cases with extremity injuries would be re-rated as whole person if a psychiatric impairment also existed. This is no longer true under Colorado statute, so we think the frequency of this type of whole person rating is dropping. Also, the psychiatric ratings themselves were assumed not to change even if the Guides edition changes, because Colorado has its own numerical psychiatric ratings. The categories of “Psychological Impairment only” and “Extremity + psych, paid as whole person” reflect these rejection criteria. Thus, four cases, about 3% of the total cases rejected, were excluded from the sample pool because they included a rating for a psychological impairment. Under the Colorado schedule, the benefits for the extremities are the same, whether paid at the shoulder or at the hip. However, because the *differences* between the *Guides* editions vary by category (lower, upper, or whole person), these database errors and statute changes (the misclassification errors discussed in the previous paragraph in conjunction with the psychiatric impairment rejections for whole person cases) suggest that our estimate of the cost differences between editions may be very slightly too large.

The decision to maintain the sample sizes within the categories of impairment ratings as the predetermined 150 Whole Person cases, 60 Lower Extremity, and 40 Upper Extremity, was supported by the rejection criteria that excluded the ten misclassified cases and the four cases with a psychological impairment. (Although as mentioned in the text, four cases were erroneously accepted that violated these criteria. This type of problem was not recognized prior to the screening process. Some cases were accepted before the issue was determined to warrant rejection.) Finally, DOWC screening resulted in rejection of another 16 cases due to a variety of discrepancies between the information in the case file and the database. These are grouped as “Other” in Table 4. These discrepancies included, for example, a case involving multiple injuries and rating reports by two different physicians. For one of the injuries, the medical documentation was adequate for the purposes of this study, but this was not true of report for the second injury. In another case, the admission used for selecting the case had a rating of 27%, but the medical report indicated a rating of 4%. Thus, the cost estimates would clearly not represent the stratum for which the case was selected. And finally, a whole person case involved a discrepancy in injured worker’s age

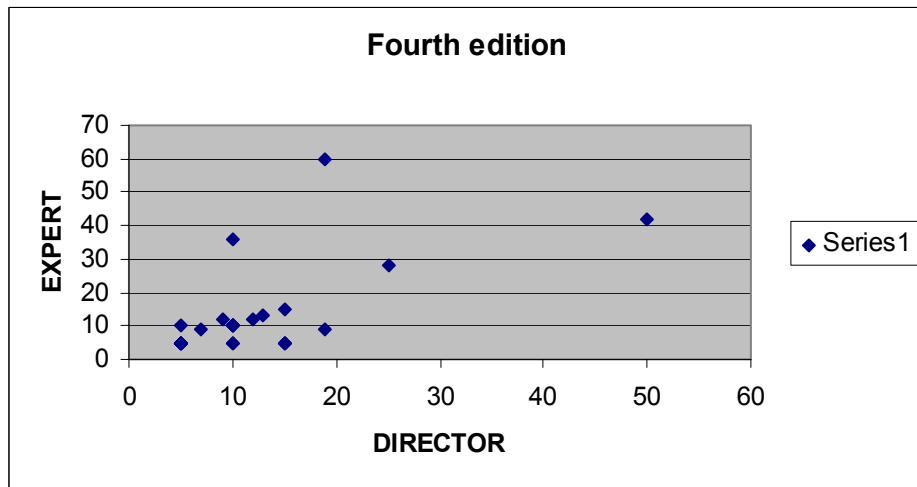
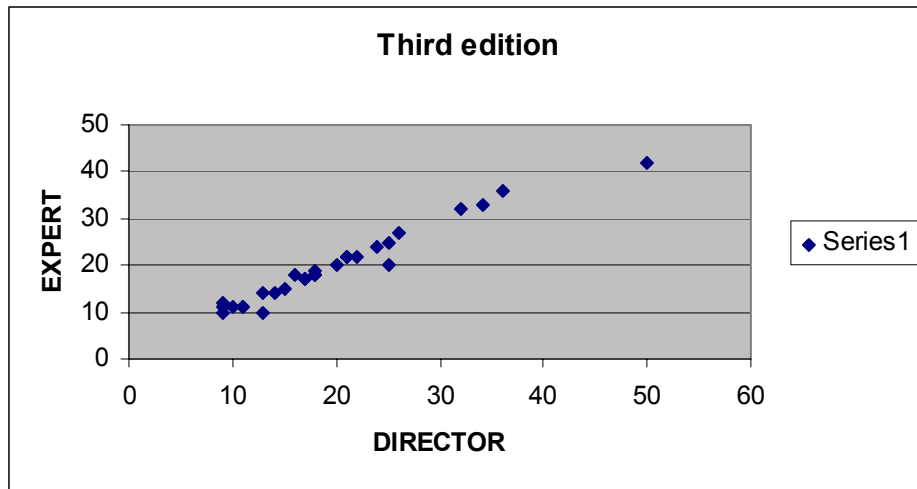
on the FA and the database. Apparently, the latter two types of discrepancies were data entry errors. Sixteen cases, accounting for nearly 14% of the rejected cases, were eliminated from the sample for these and other discrepancies.

Cases that passed DOWC screening were then forwarded to the expert reviewer, who assessed whether the case files contained information sufficient to develop impairment ratings using the 4th and 5th editions of the *AMA Guides*. Impairment ratings using the *Guides* require a great deal of information about the patient. The medical diagnosis, current history and physical assessments, activity limitations, and the types of testing done on the patient are needed, as well as specific measurements, such as range of motion (ROM), designed strictly for the purpose of rating. Some of these specific measurements have worksheets designed just for that purpose. All of this is needed to derive a rating using the Fourth or Fifth Edition from the records created for the ratings using the Third Edition Revised. In some cases, even with all of these reports, the specific documentation associated with a rating using the Third Edition Revised will be inadequate to develop a rating using the newer editions. For example, the 4th and 5th editions require the physician to measure lower extremity joint space using x-rays to determine cartilage loss and impairment for arthritis. The 3rd Edition Revised requires no such measurement. The 4th and 5th editions require specific functional descriptions to rate hip and knee replacements, and spinal x-rays to rate instability. Again, the 3rd Revised Edition requires neither of these. Thus, 14 cases, or 12% of the total rejected, were rejected because, in the judgment of the expert reviewer, the information in the medical report, though adequate to rate the case using the 3rd Edition Revised, was inadequate to rate with the 4th and 5th editions.

Although the overall rejection rate of 32% (115 cases rejected out of the 365 screened) is higher than we would prefer, it appears to us that most of these cases are rejected without creating any clear bias. Instead the use of an administrative database for these unanticipated research purposes seems to have caused most of the rejections.

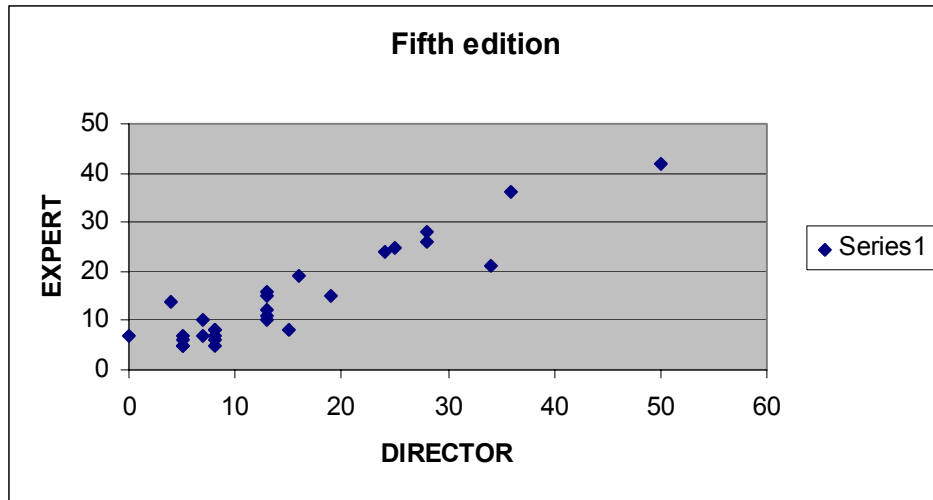
Appendix F:

Scatter Plots of Correlations between Ratings of Expert Reviewer and Medical Director on Whole Person Cases for 3rd, 4th and 5th Editions of AMA Guides



Appendix F (con't):

Scatter Plots of Correlations between Ratings of Expert Reviewer
and Medical Director on Whole Person Cases for 3rd, 4th and 5th
Editions of *AMA Guides*



Appendix G:

Detailed Cost Estimates

Conf. Level	0.95			
z-two sided	1.959961082			
			<u>Confidence Interval</u>	
	<u>Source</u>	<u>Estimated Cost</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
Whole Person	calc adm	\$102,691,996	\$95,260,690	\$110,123,301
	3rd orig	102,729,151	95,338,630	110,119,673
	3rd review	99,510,676	92,136,209	106,885,143
	4 th	59,159,813	46,680,401	71,639,226
	5 th	71,950,243	59,025,293	84,875,193
Scheduled Upper	calc adm	\$11,685,329	\$10,253,420	\$13,117,239
	3rd orig	11,489,053	9,935,729	13,042,377
	3rd review	9,436,876	7,489,082	11,384,671
	4 th	8,637,932	6,443,931	10,831,933
	5 th	8,673,505	6,539,604	10,807,405
Scheduled Lower	calc adm	\$9,639,164	\$9,210,423	\$10,067,905
	3rd orig	9,544,471	9,098,593	9,990,349
	3rd review	9,458,960	9,007,601	9,910,320
	4 th	7,126,118	6,137,880	8,114,355
	5 th	7,126,118	6,137,880	8,114,355
Totals	calc adm	\$124,016,489	\$116,436,351	\$131,596,626
	3rd orig	123,762,675	116,197,529	131,327,821
	3rd review	118,406,513	110,765,807	126,047,219
	4 th	74,923,863	62,214,575	87,633,150
	5 th	87,749,865	74,612,724	100,887,007

Legend:

calc adm: Costs calculated using information on admission.

3rd orig: Costs calculated using original treating physician's ratings for 3rd Edition Revised.

3rd review: Costs calculated using expert reviewer's ratings for 3rd Edition Revised.

4th: Costs calculated using expert reviewer's ratings for 4th Edition.

5th: Costs calculated using expert reviewer's ratings for 5th Edition.

References

AMA Guides to the Evaluation of Permanent Impairment, Third Edition, Revised. Alan Engelberg ,Editor. Chicago: AMA Press, 1990.

AMA Guides to the Evaluation of Permanent Impairment, Fourth Edition. Theodore C. Doege and Thomas P. Houston, Editors. Chicago: AMA Press, 1993.

AMA Guides to the Evaluation of Permanent Impairment, Fifth Edition. Linda Cocchiarella and Gunnar Andersson, Editors. Chicago: AMA Press, 2001.

Babistky, Steven, et al. *Understanding the AMA Guides in Workers' Compensation.* Third Edition. Frederick, MD: Panel Publishers, 2002, p. 44.

Brigham, Christopher R. *Study of the Impact of Changing from the American Medical Association (AMA) Guides to the Evaluation of Permanent Impairment, Third Edition, Revised to the Fourth or Fifth Editions in Determining Workers' Compensation Permanent Impairment Ratings.* Denver: Colorado Department of Labor and Employment, 2002.

Cocchiarella L, Turk MA, Andersson G. Improving the Evaluation of Permanent Impairment. *JAMA* 2000;283:532-533.

Colorado Workers' Compensation Act 2002: Colorado Revised Statutes, Title 8, Article 42, (CRS 8-42-107).
<http://www.coworkforce.com/DWC/PUBS/wc%20act%202002%20web%20version.pdf>

Lohr, Sharon L. *Sampling: Design and Analysis.* Brooks/Cole 1999, pp 99-101.

Oklahoma Physicians Advisory Committee, "Minutes of Physicians Advisory Committee", January 21, 1994.

Rosner, Bernard. *Fundamentals of Biostatistics*, Fourth Edition. Belmont: Duxbury Press, 1995, pp. 517-520.

Spieler EA, Barth PS, Burton JF, Himmelstein J, Rudolph L. Recommendations to Guide Revision of the *Guides to the Evaluation of Permanent Impairment.* *JAMA* 2000;283:519-528.