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

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Department of Labor and Employment
The State of Colorado

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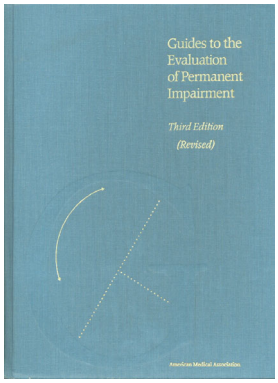
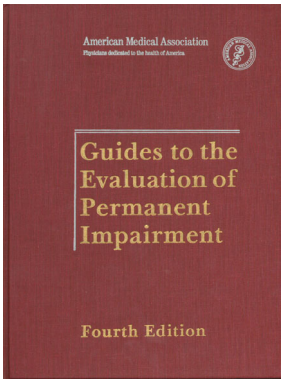
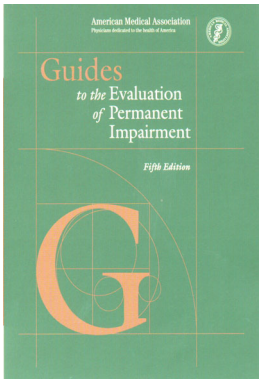
Executive Summary

The AMA *Guides to the Evaluation of Permanent Impairment*, published by the American Medical Association, are the most widely used criteria for determining permanent impairment. Impairment is defined as the "the loss of, loss of use of, or derangement of any body part, system or function". Impairment is not synonymous with disability, nor does it directly reflect functional loss. The State of Colorado Workers' Compensation Act specifies that the Third Edition, Revised of the *Guides* must be used to rate permanent impairment. The State of Colorado is the only jurisdiction that still mandates the use of this Edition that was published in December 1990. Since that time there have been two editions, the Fourth Edition published in June1993 and the Fifth Edition published in November 2000. Most workers' compensation jurisdictions make use of the Fifth Edition. The Fifth Edition states, "It is strongly recommended that physicians use this latest edition, the fifth edition, when rating impairment" (5th ed., 2). The purpose of this study was to identify the changes among these three editions by the analysis of two hundred and fifty cases and of the *Guides* themselves. The Fourth and Fifth Edition of the *Guides* are lengthier and more complex than the Third Edition, Revised.







Study Design

The study was based on the analysis of a stratified random sample of two hundred and fifty cases identified by the Division of Workers' Compensation of the Department of Labor and Employment of the State of Colorado. Each case was reevaluated by a physician expert on the use of the *AMA Guides to the Evaluation of Permanent Impairment*, assessing the quality of the previous report, and utilizing the case data to rate via the Third Edition Revised, Fourth and Fifth Editions, in accordance with the specifications provided in the contract. The results were consistent with the database of case analyses performed by the contractor separate of this study.

There are limitations to this study, including the study was limited to two hundred and fifty cases, not all types of injuries and illnesses encountered were analyzed, the review of the cases was based on the reports and not all of the medical records and other documentation associated with these cases, and the original reports did not always provide all the data that are required for rating by the Fourth and Fifth Editions. Furthermore, there were not a statistically significant number of cases for all types of work-related injuries, since cases were selected based on associated costs, not solely on frequency.

Third Edition, Revised Ratings

Although the vast majority of Third Edition, Revised Ratings reviewed resulted in the same rating by the reviewer as the original rating physician, there were opportunities for improvement with most reports. The most common problem was applying the appropriate *Guides* criteria to the clinical data presented. There were differences between values provided by the examiners and those obtained by the reviewer for upper extremity impairment cases (11.8 % upper extremity versus the original rating of 14.5 %), however differences were not significant with lower extremity and whole person permanent impairment cases. The upper extremity impairment differences resulted primarily from the presence of duplicative or inappropriate ratings. However, physicians may, in accordance with page 52 of the Third Edition, Revised, appropriately increase the rating at their discretion if they feel the measured rating does not match the severity of the clinical findings. This does provide latitude and also subjectivity in the rating process.

Upper Extremity Ratings

In terms of the forty upper extremity impairment cases reviewed, the differences among the three editions were small, overall the average corrected rating for the Third Edition, Revised was 11.8% upper extremity impairment, the Fourth Edition rating was 11.2% upper extremity impairment and the Fifth Edition was 11.3% upper extremity impairment. In summary, the most significant changes from the Third Edition, Revised are the need for a more detailed assessment (including measurements of the opposite side) and the processes for rating reflex sympathetic dystrophy (complex regional pain syndrome) and “other disorders”.

Lower Extremity Ratings

Sixty cases of lower extremity impairment were reviewed; the most common region involved was the knee representing 73% of these cases. The values obtained with the Fourth and Fifth Editions were identical, since the rating process with these two editions is identical. The average rating overall was 18.2% lower extremity impairment with the Third Edition, Revised and 14.0% lower extremity impairment with the Fourth and Fifth Editions. It is probable that physicians will have a tendency to combine multiple methodologies as they did with the Third Edition, Revised when they should be selecting a single methodology in most cases. Examinations will take greater time since more approaches need to be considered and more measurements must be obtained, unless specific guidance or limitation are established by the Division. It is also probable that there will be controversy over the choice of the methodology and at times whether more than one methodology should have been used.

Whole Person Ratings

One hundred and fifty whole person permanent impairment cases were reviewed, and 136 of these involved the spine. The average whole person was 19.5% permanent impairment with the Third Edition, Revised and 11.8% whole person permanent impairment with the Fourth Edition. With the Fifth Edition, using a conservative interpretation of the cases there was an average of 13.7% whole person permanent impairment and using a more liberal interpretation of the reports reviewed this was 14.3%. In summary, spinal impairment ratings using the Third Edition Revised are higher than those obtained from the

Diagnostic-Related Estimates (DRE) Model or Method. This is largely due to the inclusion of range of motion deficits that may be more reflective of aging and limited flexibility, than the injury itself.

Controversies

The areas of greatest controversy in the most recent, Fifth Edition, of the *Guides* will be rating permanent impairment for pain, assessment of complex regional pain syndrome, and selecting the appropriate methodology for lower extremity and spinal impairment rating. This report provides plausible recommendations on how to deal with the various controversies in each edition of the AMA Guides evaluated. For example, with the Fourth Edition, in rating the spine providing further directives on the process and using ranges of values for spinal impairment for Diagnosis-Related Estimates (DRE) rather than a fixed number. With the Fifth Edition, for example, it is recommended that the DRE ratings be based on the documentation of findings since the time the examinee has been at maximum medical improvement and not necessarily limited to those observed at the time of the rating examination, the Range of Model method be used for rating all surgical fusions, complex regional pain syndrome be rated using Chapter 13, The Central and Peripheral Nervous System, and guidance be provided on the use of methods in Chapter 17, The Lower Extremities. Due to the subjective aspect of pain, it is recommended that quantitative ratings not be provided from Chapter 18, Pain, however this Chapter may be used to assist in placing an examinee within a DRE spinal impairment category range.

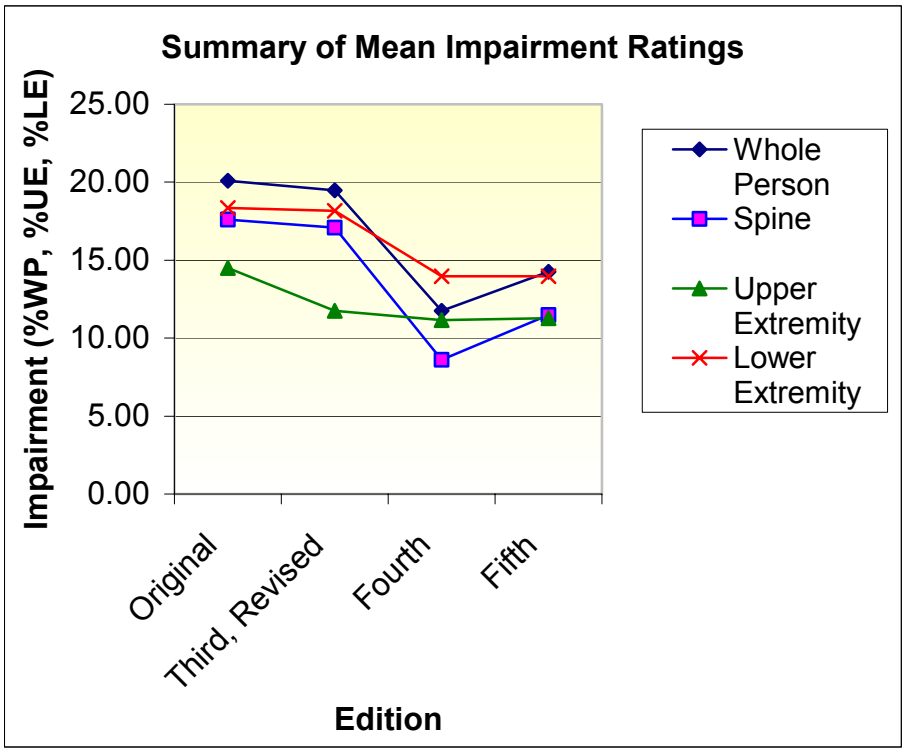
Summary

The *AMA Guides to the Evaluation of Permanent Impairment* are the current standard for assessing impairment. The Fourth and Fifth Editions are more complex than the Third Edition, Revised, and, in general, will require more effort by rating physicians and result in lower ratings. This report explores the differences among these Editions, including inconsistencies and errors, and provides suggestions on modifications that would improve the process of rating impairment.

Table 1 Summary of Impairment Ratings

	Number	Original	Third, Revised	Fourth	Fifth
Whole Person	150	20.10 %WP	19.47%WP	11.75%WP	14.26%WP
Spine	136	17.60%WP	17.10%WP	8.61%WP	11.49%WP
Upper Extremity	47	14.50%UE	11.76%UE	11.15%UE	11.28%UE
Lower Extremity	62	18.35%LE	18.15%LE	13.97%LE	13.97%LE

Figure 1 Summary of Impairment Ratings



Introduction

The AMA *Guides to the Evaluation of Permanent Impairment* are the most widely used criteria for determining permanent impairment as evident in Appendix, "*State Specific Use of the AMA Guides*". The State of Colorado Workers' Compensation Act specifies that the Third Edition, Revised of the *Guides* must be used to rate permanent impairment. The Third Edition, Revised was published on December 1990 and since that time there have been two editions, the Fourth Edition published in June 1993 and the Fifth Edition published in November 2000. The purpose of this study was to: quantitatively assess the impairment rating changes among the AMA Guides Third Edition, Revised to the Fourth and Fifth Editions and identify any qualitative differences between each edition.

Impairment ratings are used as the basis for permanent impairment awards. According to Colorado statute ratings must be performed in accordance with the processes defined in the *AMA Guides to the Evaluation of Permanent Impairment, Third Edition, Revised.* There are significant differences among the Third Edition Revised, Fourth and Fifth Editions. Therefore, it is necessary to understand how these differences in methods will impact the rating process and the ratings.

Methods

Overview

The impact of changing from the AMA Guides Third Edition, Revised to the Fourth or Fifth Editions was identified by analyzing a select sample of cases and by the contractor's expert knowledge about the differences among the three editions. A stratified random sample of two hundred and fifty cases was identified by the Division of Workers' Compensation of the Department of Labor and Employment of the State of Colorado. Each case was reevaluated by a physician expert on the use of the *AMA Guides to the Evaluation of Permanent Impairment*, assessing the quality of the previous report, and utilizing the case data to rate via the Third Edition Revised, Fourth and Fifth Editions, in accordance with the specifications provided in the contract. The consultant serves as the Editor of the AMA *Guides Newsletter* and the AMA *Guides Casebook*, has taught thousands of physicians how to assess impairment, and has performed and/or reviewed several thousands of cases. His curriculum vitae is provided in the Appendix.

Process

Sampling and Review Process

The sampling frame was the set of claimants who received admitted Permanent Partial Disability (PPD) benefits for injuries occurring on or after July 1, 1991. The list was compiled from Closed Claim studies done at the Colorado Division of Workers' Compensation (DOWC) in 2000 and 2001. Cases were stratified into three broad categories: 40 Upper Extremity cases, 60 Lower Extremity cases, and 150 Whole Person cases. A larger representation of lower extremity and whole person cases was chosen since the largest change in the impairment rating systems between editions occurred in these two areas. Additionally, whole person cases incur significantly greater system costs than extremity cases. Cases were included as Whole Person, if they were based on impairment ratings that were required to be paid as whole person in Colorado, which generally means they were not extremity only cases. Cases with only psychological impairment ratings were excluded from the Whole Person sample. This exclusion was done because there is no method for numerical psychological ratings in the *Guides*. Cases with chronic pain only did not exist because the Colorado statute prohibits rating chronic pain without anatomic or physiologic correlation. Because of their minimal influence on total system cost, scheduled cases with Lower Extremity PPD benefits less than $1500 were excluded. Scheduled cases were required to have matching calculated and paid benefits. Only case records with documented information adequate to calculate a rating under the Fourth and Fifth edition of the *AMA Guides* were included.

For scheduled injuries, sampling was stratified by cost, which in Colorado is directly proportional to the impairment rating. Cost intervals $1560 (5% of the maximum scheduled benefit) in width were defined. The number of scheduled injury cases selected for the study within each cost interval was determined by the proportion of the total dollar cost incurred in that category. For example, 25% of the total dollar cost for scheduled upper extremity injury was paid out for benefits between $3120 and $4680; therefore, 10 of the 40 upper extremity sample cases were randomly selected from the 1273 upper extremity PPD cases whose benefits fell within that interval. Similarly, 23% of the PPD dollar benefits for lower extremity claims were paid within that same category, and 14 of the 60 lower extremity sample cases were randomly selected from the 1034 closed lower extremity claims with benefits in the same interval.

Because in Colorado Whole Person benefits are paid on both medical and non-medical criteria such as age and salary, the sampling for Whole Person cases did not consider dollar costs paid. Rather, percentage points of impairment were treated as units, and the number of cases selected from each percentage category was determined by the proportion of the total percentage units within that category. For example, approximately 25% of the total number of percentage units in the Whole Person population were awarded to claimants whose ratings were between 15% and 20%; accordingly, 25% of the Whole Person sample cases were randomly selected from the 1738 admitted claims with Whole Person impairments between 15% and 20%. More than 150 whole person cases were randomly selected, in order to allow for case rejection after record review.

Before being finally included in the study, the case records available to the DOWC from the randomly selected cases were examined to ensure that they contained adequate information for a third party determination of impairment under all three editions of the *Guides*. The DOWC generally receives only the final report that accompanies the impairment rating. Treating physicians frequently do not repeat information in the final report that is available in their prior treatment records. Additionally, some measurements needed to rate a case under the Fourth and Fifth editions may not be included in the reports submitted for revised Third Edition, Revised ratings, where the measurements may not have been required. Cases were rejected from the sample by DOWC staff if they contained no narrative report (13 cases), if the actual measurements for each spinal range of motion was not reported (38 cases), if no medical record or final admission was in the file (5 cases), if a diagnosis was not stated (5 cases), or if other miscellaneous errors or omissions occurred (9 cases). (Some cases had several "fatal" errors, but each rejected case is only mentioned once in this listing.) The reviewing physician rejected an additional 11 cases, for failing to have adequate information within the medical record to create the Fourth or Fifth Edition rating. All rejected cases were replaced by a randomly selected case from the same category as the rejected case, to keep the sample sizes as described above.

The selected cases were placed in random order within each major category, and then divided into six sections that were analyzed sequentially: Section 1: Whole Person Cases (including spine), Section 2: Upper Extremity Cases, Section 3: Lower Extremity Cases, Section 4: Whole Person Cases (including spine), Section 5: Upper Extremity Cases, and Section 6: Lower Extremity Cases. Teleconference meetings were held approximately weekly to discuss issues relevant to the cases reviewed

Database Design

A relational database system was designed and developed using Microsoft Access to facilitate data collection and analysis. This consisted of six primary tables: Case (case related information), Claim (claim data), Rating3Original (rating data provided by the original reviewer and analysis by the reviewer), Rating3Reviewer (reviewer rating data independently rating the case using the Third Edition Revised), Rating4 (reviewer rating data using the Fourth Edition), and Rating5 (reviewer rating data using the Fifth Edition). Data elements were defined for each case as specified in the Contractor's Statement of Work.

Interrater Reliability

Interrater reliability was obtained by having one fifth or twenty percent of the cases independently reviewed by the Medical Director of the Division of Workers Compensation, Department of Labor and Employment of the State of Colorado. The Medical Director is also an expert on the use of the *Guides* and is the Course Director for the Colorado Level II Physician's Accreditation Course, in which physicians are taught how to perform impairment rating evaluations. The Medical Director of the Colorado Division of Workers' Compensation reviewed approximately 20% of the cases selected at

random: 28 whole person cases, 12 lower extremity cases, and 7 upper extremity cases. Some a priori agreements between raters were reached regarding assumptions in order to deal with the case records being created only for the 3rd revised edition. Additionally, current Colorado impairment rating guidelines directions were agreed to be used by both raters. Interrater reliability was measured for each of the three types of case for each of the three editions of the *Guides.* The Pearson correlation coefficient may overestimate agreement between raters; for example, raters who differ by a large but constant amount may have perfect correlation. The intraclass correlation coefficient from a two-way random effects analysis of variance is a generally preferred measure of agreement between raters and was used in this study.

Table 2 Interrater Reliability: Intraclass Correlation Coefficients

	3rd Revised	4th	5th
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.

Interrater reliability for whole person cases was also measured by the frequency with which whole person ratings differed by 5% or more. Whole person ratings differed by 5% or more in 1 of 28 Third Edition cases, in 7 of 28 Fourth Edition cases, and in 5 of 28 Fifth Edition cases. Paired t tests were used to test the hypothesis that mean ratings differed between raters; in no edition did the mean ratings differ significantly between raters, either for whole person or for extremity ratings.

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 applicability 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. It does show that the reviewing physician used reproducible standards in the reviews of the sample cases. However, the differences found in reproducibility between editions of the *Guides* may be related to differences in interpretation of the editions studied, and these differences may predict areas of disagreement likely to arise in applying the *Guides* in cases involving permanent impairment.

Assumptions

In assessing these cases it was assumed that the clinical data provided by the examining physicians was valid and reliable. If there were serious questions about validity and reliability, upon consultation with both the reviewing physician and the Colorado Medical Director, the case was replaced.

There are opportunities for improvement, particularly in terms of providing limited information. With changes in the procedures used in the Fourth Edition and Fifth Editions, certain new data will be required in rating these cases. Therefore it was necessary to consistently apply assumptions that included:

1. In general, clinical findings that were questionable but were rated by the initial examining physician were considered ratable.

2. For spinal cases, if there were any findings in the report reviewed that appeared to be objective as defined by the examiner and the examinee had received a rating under the Third Edition, Revised, he or she was rated at least as a Diagnosis-Related Estimates Category II in the Fourth and Fifth Editions. It is recognized that the lack of documented objective findings that would result in impairment with the Fifth Edition, may reflect lack of physician documentation rather than lack of the examinee having ratable findings. Therefore, impairment rating values were also provided for Fifth Edition cases where per the Third Edition, Revised and the Fourth Edition there was ratable impairment, however ratable findings as documented in Fifth Edition criteria were not present.

3. For spinal cases, if there was a diagnosis of radiculopathy, even if the required objective findings were not documented in the reviewed report, the patient was considered to be at least a Diagnosis-Related Estimates Category III rating per the Fourth Edition. The specific directive in the Fifth Edition were followed, e.g. if there had been a history of radiculopathy that resolved with non-surgical interventions and there were no findings of radiculopathy at the time of maximum medical improvement a rating of Diagnosis-Related Estimates Category II was assigned, otherwise the rating would be at least a Diagnosis-Related Estimates Category III. It is noted that most of the ratings reviewed did not provide all the data that may be used in classifying a patient in a DRE Category with the Fourth and Fifth Editions, for example, thigh and calf circumferences were rarely documented.

4. For spinal cases, when the Diagnosis-Related Estimates method was used for the Fifth Edition rating the individual would be rated at the highest value within a range, unless there was information that would suggest this was inappropriate.

5. Neurological findings were considered objective, unless there was no reference to an injury that could result in neurological deficits or the findings were not in an anatomic distribution.

6. For knee cases, if there was reference to chondroplasty and a rating for arthritis, the individual was graded as having arthritis with a 3-mm. cartilage interval.

7. Pain impairment was not included in Fifth Edition ratings, principally due to the fact that the reports provided inadequate data to determine if pain should be rated and what the extent of impairment.

Colorado statute 8-42-101 (3.7) disallows rating for pain without anatomic or physiologic correlation, stating "On and after July 1, 1991, all physical impairment ratings used under articles 40 to 47 of this title shall be based on the revised third edition of the "American Medical Association Guides to the evaluation of the Permanent Impairment" in effect as of July 1, 1991. For purposes of determining levels of medical impairment pursuant to articles 40 to 47 of this title a physician shall not render a medical impairment rating based on chronic pain without anatomic or physiologic correlation. Anatomic correlation must be based on objective findings." This would not be a factor in Third Edition, Revised and Fourth Edition ratings since quantitative impairment is not given for pain, however the Fifth Edition does provide for the option of quantitative impairment for pain of up to 3% whole person permanent impairment in certain situations.

Limitations

There are limitations to this study, primarily in the following areas.

- The study was limited to two hundred and fifty cases,
- The study did not include all injuries and illnesses that may be encountered in the workers' compensation arena,
- The review of the cases was based on the reports and not all of the medical records and other documentation associated with these cases,
- The original reports did not always provide all the data that is required for rating by the Fourth and Fifth Editions, and
- There was not a statistical significant number of cases for all types of work-related injuries, e.g. some relatively common diagnoses may have been under represented because the selection process was based on cost not diagnosis, e.g. there were few hand injuries, entrapment neuropathies, and neurological injuries.

Results

Demographics

Two hundred and fifty cases were reviewed; these included one hundred and fifty whole person cases (including spine), forty upper extremity impairment cases and sixty lower extremity impairment cases. Ninety percent of the whole person cases involved the spine as least as one of the components.

Table 3 Demographics

Age:	43 years old (mean)		Stnd. Dev. 11.1 years (Range 18 to 71)
Sex:	Male (68%)		Female (32%)
Date of Injury:	December 21, 1998	(median)	Range June 30, 1992 to January 9, 2001
Date of MMI:	1.29 years post injury	(mean)	
Region Rated:	Lumbosacral spine		(most commonly rated region)
Evaluator:	Physical medicine		(37.5% of cases)

Age and Sex

The average age of the examinee, as reported by the examining physician and/or in other documentation, was 42.9 years old, with a standard deviation of 11.1 years and a range of 18 to 71 years. The age was not sent to the reviewer in 31 cases. The average age did not vary significantly dependent on the type of case. The average age for whole person was 42.6 years (standard deviation 10.0 years), upper extremity was 43.7 years (standard deviation 12.8 years) and lower extremity was 43.1 years (standard deviation 10.5 years).

Approximately two thirds of the examinees were male (68%, 171 of 250). There were differences in the sex ratios based on the type of case. An equal percentage of men and women were present in the upper extremity impairment ratings (of the 40 cases, 20 were female and 20 were male). Lower extremity impairment ratings were primarily male (73%, 44 of 60), as were whole person impairment ratings (71%, 107 of 150).

Date(s) of Injury

The earliest date of injury was June 30, 1992, the most recent injury date was January 9, 2001, and the median date was December 21, 1998. On the average the examinee achieved maximum medical improvement 1.29 years after the injury, with a mean of 1.00 years and standard deviation of 1.12 years.

Types of Impairment Ratings

Spinal injury was the primary diagnosis in one hundred and seventeen in 78% of the whole person cases, and was involved in one hundred and thirty six (91%) of the whole person cases. The lumbosacral spine (low back) was most commonly involved, representing the primary diagnosis in seventy-seven of the cases (e.g., 67% of the spinal cases and 51% of all whole person cases). The lumbar spine was rated in a total of eighty-seven of the whole person cases. Some of the whole person impairment cases involved multiple spinal regions; therefore the lumbosacral spine (low back) was also rated in another ten cases. The cervical spine was the primary diagnosis in twenty-seven cases (23% of the spinal cases and 18% of all whole person cases) and present in a total of thirty-eight cases. Therefore, it was nearly three times as likely to have the low back as the primary injury, compared to the neck. A thoracolumbar spine injury was the sole diagnosis in only a single case, however this region of the spine was present in a total of thirteen cases.

Table 4 Cases Reviewed: Most Common Categories (Primary Problem)

Category	Rating
Whole Person	150
Lumbosacral spine	77
Cervical spine	27
Lower Extremity	60
Knee	44
Upper Extremity	40
Shoulder	14

The majority of the lower extremity cases involved the knee; with forty-six (77%) of the sixty lower extremity cases having a knee injury as the primary diagnosis. Thirteen (22%) of these cases had a primary diagnosis of an ankle / foot injury.

The most common diagnosis of the upper extremity cases reviewed was a shoulder injury, representing fourteen of the forty upper extremity cases (35%). Shoulder disorders were also a component of some whole person cases, e.g. they were not limited to the upper extremity cases section. There were a total of 27 cases involving the shoulder.

Only seventeen (6.8%) of the cases involved a psychological impairment assessment.

Fifty (20%) of the cases were performed by a Division of Workers Compensation Independent Medical Examiner (DIME). DIME evaluations were performed in 43 (29%) of the whole person cases, however in only 5 (12.5%) of the upper extremity cases, and 2 (3%) of the lower extremity cases.

Types of Examiners Represented

Examiners in Colorado performed all of the ratings. Physical medicine and rehabilitation physicians were the specialists who most often performed the ratings; seventy-three (38%) of the one hundred and ninety-two cases where the specialist information was available. This was followed by occupational medicine, orthopedic surgery, and neurology.

Table 5 Specialty Performing Evaluation

Evaluator Specialty	Cases
Physical medicine	73
Not specified	58
Occupational medicine	53
Orthopedic surgery	32
Neurology	17
Family practice	8
Hand surgeon	6
Neurosurgery	3

Upper Extremity Impairment Ratings

Cases

Forty cases of upper extremity impairment were reviewed, however additional upper extremity impairments were incorporated in whole person permanent impairment ratings. Of the upper extremity cases, 20 (50%) involved the right upper extremity, 14 (35%)involved the left upper extremity, and 6 (15%) involved both extremities. The most common region involved was the shoulder, representing 14 (35%) of the 40 cases as the primary diagnosis. The most common problem was a rotator cuff injury. Only the right shoulder was rated in 14 cases, only the left shoulder in 8 cases, and both shoulders in 5 cases, e.g. of the 40 cases the right shoulder was involved in 19 cases and the left shoulder was involved in 13 cases.

Five of the cases reflected a cumulative trauma rating approach unique to the State of Colorado; the AMA *Guides* typically do not rate cumulative trauma disorders unless there is nerve entrapment or certain less common disorders. The relatively small sample size reduces the precision value of the data, particularly for comparisons among individual digit and hand injuries. Although carpal tunnel syndrome (median nerve entrapment) is a common work-related injury, the study sample included only two such cases.

Ratings

Upper extremity ratings analysis involved converting all regional impairments to upper extremity and including both right and left extremities. Although there were 40 upper extremity cases, there were 47 upper extremity values since some of the cases had bilateral involvement. Overall, the reviewer's reassessment of the cases resulted in an mean upper extremity impairment apportioned rating of 11.8% (standard deviation 13.3%) upper extremity impairment compared to the previous rating of 14.5% (standard deviation 13.4%) e.g. 81% of the previous rating. This resulted primarily from what was judged to be the presence of duplicative or inappropriate ratings, such as: 1) rating a shoulder for both motion deficits and crepitation, 2) rating for pain and weakness as a neurological disorder when no neurological disorder was present, 3) rating for strength loss when not appropriate, and 4) rating for both carpal instability and motion deficits. It is recognized that some of these differences may reflect differences in physician judgment. Physicians may, in accordance with the Third Edition, Revised (3rd ed., Revised, 52), appropriately increase the rating at their discretion if they feel the measured rating does not match the severity of the clinical findings. The Fifth Edition does not provide the same directives, however, Chapter 16, The Upper Extremities, states "If the total combined whole person impairment does not seem to adequately reflect the actual extent of alteration in the individual's ability to perform activities of daily living, this should be noted." (5th ed., 435).

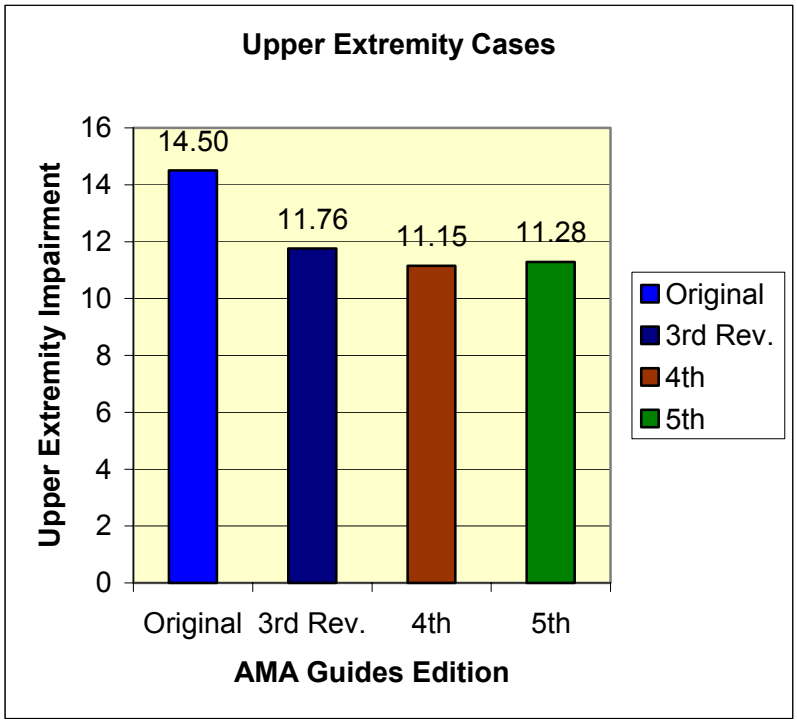
The mean right upper extremity impairment was 15.2% upper extremity impairment versus 13.6% upper extremity impairment on the left for the original Third Edition revised ratings, with a standard deviation for these ratings of 13.4%. The reviewer found for the Third Edition, Revised a mean of 13.2% upper extremity impairment on the right and 10.0% on the left with a standard deviation of 13.3%.

The ratings with the Third Edition, Revised resulted in mean impairment of 11.76% upper extremity impairment with a standard deviation of 13.31% upper extremity impairment, with the Fourth Edition mean impairment of 11.15% upper extremity impairment with a standard deviation of 14.16% upper extremity impairment, and with the Fifth Edition mean impairment of 11.28% upper extremity impairment with a standard deviation of 14.31% upper extremity impairment.

Table 6 Comparison of Upper Extremity Impairment Ratings by Edition

Region	Third Edition, Revised (Original Rating)	Third Edition, Revised (Reviewer Rating)	Fourth Edition	Fifth Edition
Mean	14.50 % UE	11.76 % UE	11.15 % UE	11.28 % UE
Median	10 % UE	10 % UE	9.5 % UE	9.5 % UE
Standard Deviation	13.36 % UE	13.31 % UE	14.16	14.31 % UE

Figure 2 Upper Extremity Impairment by Edition



The following table reflects the mean impairment ratings for regions; note the small sample sizes.

Table 7 Comparison of Upper Extremity Impairment Ratings by Edition

Region	Number Cases (Primary Dx)	Third Edition, Revised (Original Rater)	Third Edition, Revised (Reviewer)	Fourth Edition	Fifth Edition
Shoulder	14	12.6 % UE	9.7 % UE	10.2 % UE	10.0 % UE
Elbow	4	8.1 % UE	8.1 % UE	1.0 % UE	1.0 % UE
Wrist	5	13.3 % UE	10.4 % UE	9.6 % UE	11.0 % UE

Documentation

Most of the upper extremity impairment ratings did not include a "Figure 1. Upper Extremity Impairment Evaluation Record"; a desirable feature of all upper extremity impairment reports. This is despite the Colorado requirement that this figure be completed. It also must be noted that the medical/impairment rating reports were extracted from the Division of Workers' Compensation files. The impairment rating reports attached to the adjusters Final Admission (FA) and used in this study may not have all the impairment rating forms required to be submitted by the physician Range of motion findings of the opposite extremity were rarely provided; a specific requirement in the Fifth Edition.

Lower Extremity Impairment

Cases

Sixty cases of lower extremity impairment were reviewed; additional lower extremity impairments were also incorporated in whole person permanent impairment ratings. Thirty-two (53%) of the injuries involved the right lower extremity, twenty-seven (45%) involved the left lower extremity and one involved both lower extremities. The most common region involved was the knee representing the primary diagnosis in 73%, 44 of the 60 cases. Typically the knee injuries reflected an internal derangement, such as a meniscal injury, with the rating based on combined impairment due to range of motion deficits and impairment for one or more disorders derived from Table 40. Impairment Ratings of the Lower Extremity for Other Disorders of the Knee (3rd ed. Rev., 68). Thirteen (22%) of these cases had a primary diagnosis of an ankle / foot injury.

Ratings

The reviewer's reassessment of the cases resulted in an average apportioned lower extremity impairment rating of 18.15% lower extremity impairment that was very close to the previous rating of 18.35%. The values obtained with the Fourth and Fifth Editions were identical, since the rating process with these two editions is identical. The average rating overall was 18.15% lower extremity impairment with the Third Edition, Revised and 13.97% lower extremity impairment with the Fourth and Fifth Editions.

Table 8 Comparison of Lower Extremity Impairment Ratings by Edition

Region	Third Edition, Revised (Original Rating)	Third Edition, Revised (Reviewer Rating)	Fourth Edition	Fifth Edition
Mean	18.35 %LE	18.15 % LE	13.97 % LE	13.97 % LE
Median	18 %LE	17.5 %LE	10.5 % LE	10.5 % LE
Standard Deviation	8.65 %LE	8.47 %LE	9.76 % LE	9.76 % LE

The relationship between a Third Edition, Revised and Fourth Edition rating is displayed in the following graph:

Figure 3 Lower Extremity Impairment by Edition

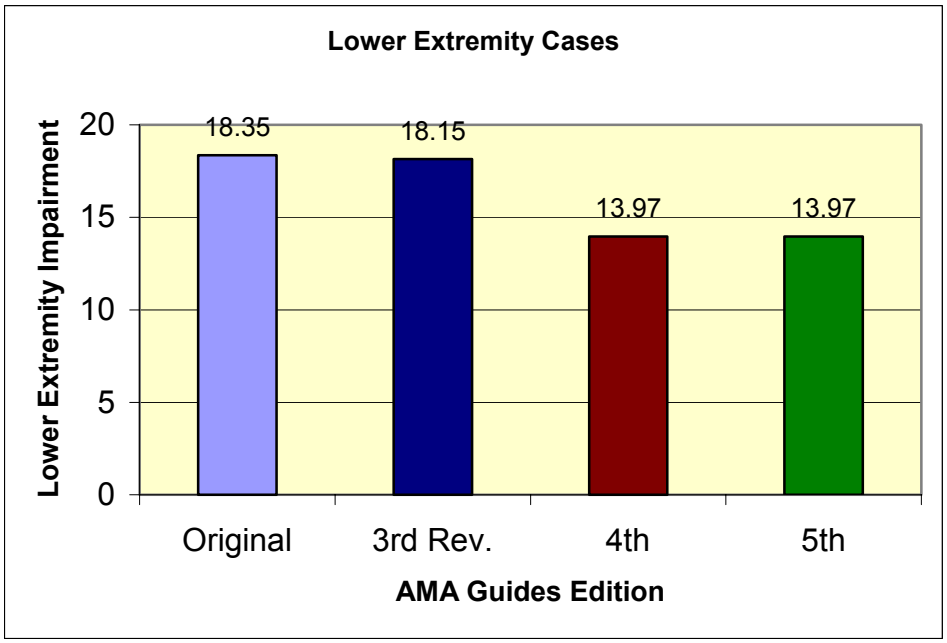
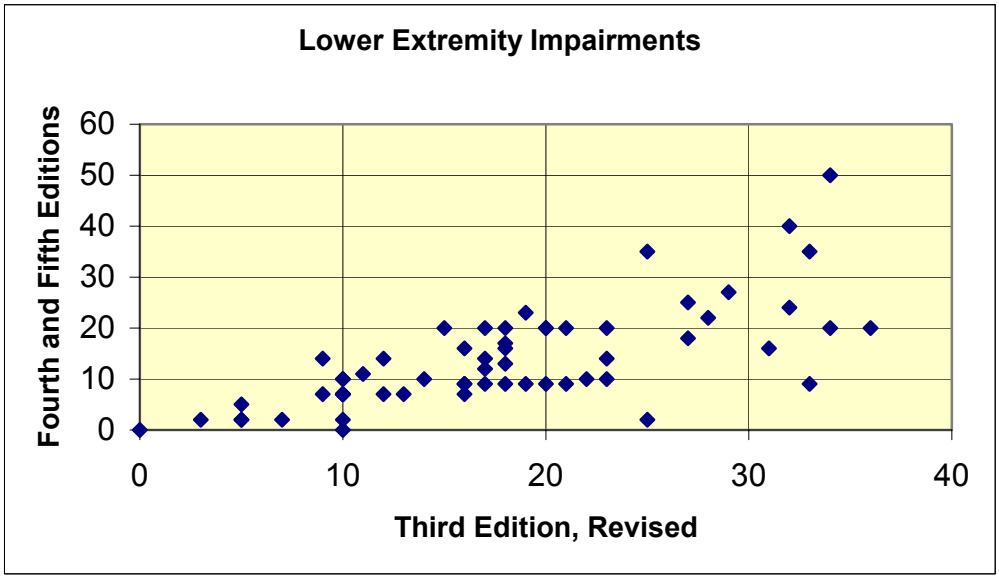


Figure 4 Comparison of Lower Extremity Individual Ratings



Differences were more significant with the knee (18.1% vs. 12.9%) than with the ankle (17.2% vs. 17.4%). There appeared to be significant variation on how examiners would grade impairment when using Table 40. Impairment Ratings of the Lower Extremity for Other Disorders of the Knee (3rd ed. Rev., 68), e.g. this table provides for broad ranges of impairment for specific disorders, and some evaluators appeared more liberal than others in their ratings.

Table 9 Comparison of Lower Extremity Impairment Ratings by Edition

Region	Number Cases (Primary Dx)	Third Edition – Revised (Original Rate)	Third Edition – Revised (Reviewer)	Fourth Edition	Fifth Edition
Knee	34	**18.11 %LE**	**18.07 %LE**	**12.90 %LE**	**12.90 %LE**
Median		18 %LE	18 %LE	9.5 %LE	9.5 %LE
Standard Dev		8.62 %LE	8.60 %LE	8.50 %LE	8.50 %LE
.					
Ankle / Foot	13	**16.00 %LE**	**15.69 %LE**	**15.08 %LE**	**15.08 %LE**
Median		17 %LE	16 %LE	14 %LE	14 %LE
Standard Dev.		6.65 %LE	6.65 %LE	12.10 %LE	12.10 %LE

Most reports did not reference findings of the opposite lower extremity, which are not required in the Third Edition, Revised however are specifically required in the Fifth Edition

Whole Person Impairment

Cases

One hundred and fifty cases of whole person permanent impairment were reviewed. The vast majority (91%, 136) of these whole person cases involved the spine, as least one of the regions that was rated. The most common region involved was the lumbar spine (low back) being rated in 58% (87) of the whole person cases; this was followed by the cervical spine (neck) rated in 25% (38) of the cases and the thoracic spine rated in 9% (13) of the cases. More than one region of the spine may be rated.

Ratings

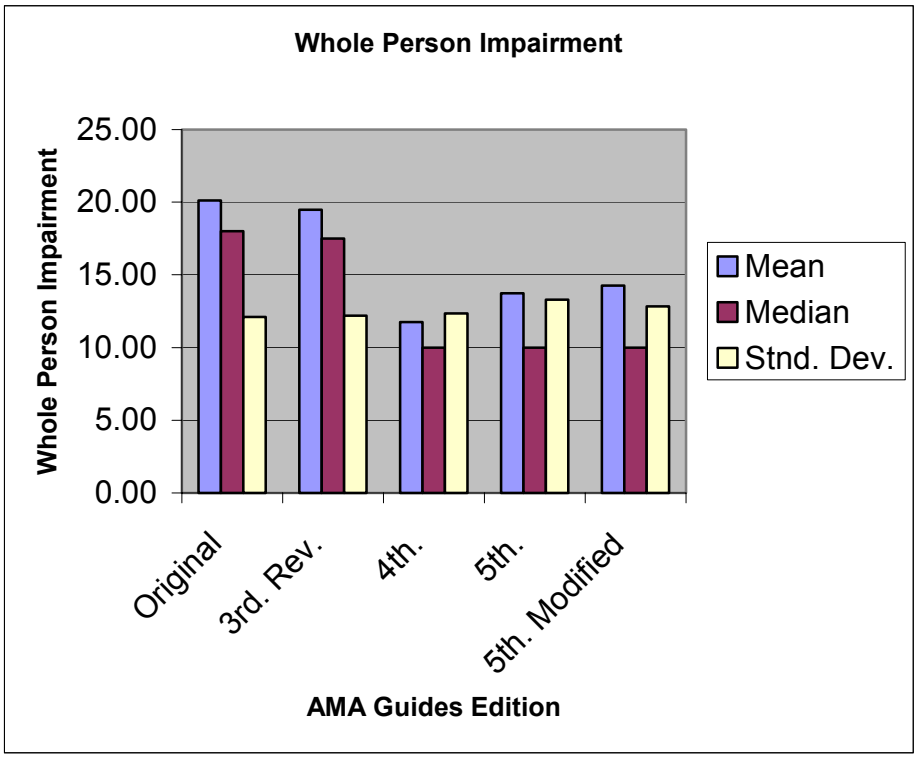
The Fifth Edition of the *Guides* presents a significant change in philosophy in rating spinal impairment by clearly defining the objective findings required for a rating. Under the Colorado Level II Physician's Accreditation Curriculum the patient must have at least a minimum of six months of medically documented pain and rigidity before any spinal impairment can be given. The difficulty with evaluating this criteria is that pain is a subjective report and rigidity may be interpreted as decreased motion, a common finding among individuals without a spinal injury. This requirement does not appear in the Fifth Edition in terms of the use of the diagnosis-related estimates (DRE) method., if there are no objective findings at the time of evaluating for permanent impairment, there is no ratable impairment. This represents a significant change from the Third Edition, Revised where a patient may have ongoing complaints, work restrictions imposed as a basis of their history and complaints, however have a physical examination that only reveals motion deficits. With the Third Edition, Revised the Range of Motion model would result in significant impairment, however by the Fifth Edition there may be no ratable impairment, since the patient would be assigned to "Diagnosis-Related Estimates Category I." It is recognized that the lack of documented objective findings in the reports reviewed that would result in impairment with the Fifth Edition, may reflect lack of physician documentation rather than lack of the examinee having ratable findings. Therefore, data is presented both in strict accordance with the Fifth Edition, e.g. twenty-one cases (15% of the cases where the spinal was rated) would receive no ratable spinal impairment by the Fifth Edition (however would receive impairment by the Third Edition, Revised and Fourth Edition) and by assignment of these cases to a low range Diagnosis-Related Estimates Category II at 5% whole person permanent impairment.

The reviewer's assessment of impairment was very close to those of the original evaluators. The slight difference resulted primarily from errors in using criteria in the *Guides*, i.e. identifying the wrong impairment for a range of motion deficit. The average impairment for Third Edition, Revised ratings for all whole person cases was 19.47% and the Fourth Edition resulted in the lowest value of 11.75% whole person permanent impairment. If the rating reports were interpreted conservatively using the Fifth Edition, e.g. if there were no ratable findings documented there was no ratable impairment, the overall whole person permanent impairment averaged 13.73%. If these cases were assigned at least a 5% whole person permanent impairment, e.g. a Diagnosis-Related Estimates Category II, the impairment was 14.26% whole person permanent impairment.

Table 10 Comparison of Whole Person Impairment Ratings by Edition

Region	Third Edition, Revised (Original Rating)	Third Edition, Revised (Reviewer Rating)	Fourth Edition	Fifth Edition	Fifth Edition Modified
Mean	20.1 %WP	19.47 %WP	11.75 %WP	13.73 %WP	14.26 %WP
Median	18.0 %WP	17.50 %WP	10.00 %WP	10.00 %WP	10.00 %WP
Standard Deviation	12.10 %WP	12.19 %WP	12.34 %WP	13.30 %WP	12.82%WP

Figure 5 Whole Person Impairment by Edition



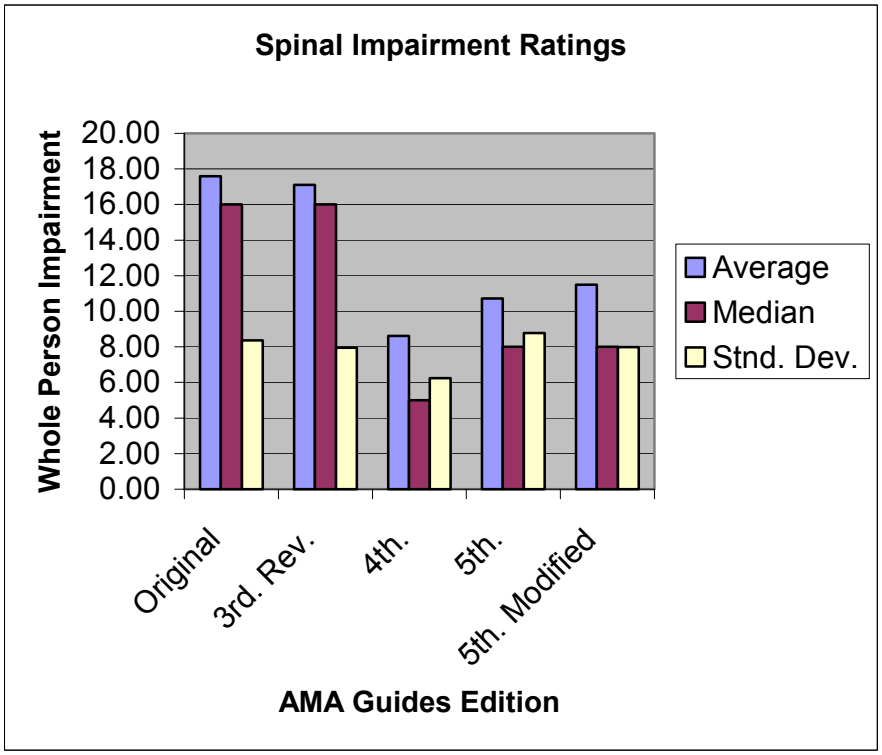
Overall, the reviewer's reassessment of the spinal cases resulted in an average whole person impairment rating of 17.1% compared to the original rating of 17.6%. Overall, Fourth Edition spinal impairment ratings averaged 8.61%, Fifth Edition interpreted conservatively as written 10.72% and the Fifth Edition, modified, as 11.49%.

Table 11 Spine Impairment Ratings by Edition

Region	Third Edition, Revised (Original Rating)	Third Edition, Revised (Reviewer Rating)	Fourth Edition	Fifth Edition	Fifth Edition Modified
Mean	17.60 %WP	17.10 %WP	8.61 %WP	10.72 %WP	11.49 %WP
Median	16.0 %WP	16.00 %WP	5.00 %WP	8.00 %WP	8.00 %WP
Standard Deviation	8.36 %WP	7.95 %WP	6.24 %WP	8.78 %WP	7.98 %WP

(n=136)

Figure 6 Spine Impairment Ratings by Edition



Lumbosacral and Cervicothoracic spine impairment ratings as performed by the original evaluators averaged the same 16.96% whole person permanent impairment. The reviewer determined slightly different ratings, 16.35% whole person permanent impairment for the lumbosacral spine and 16.74% for the cervicothoracic spine. For the lumbosacral spine, the average Fourth Edition rating was 7.25% whole person permanent impairment, the Fifth Edition as written 9.92% whole person permanent impairment, and the Fifth Edition, modified 10.62% whole person permanent impairment. For the Cervicothoracic spine, the average Fourth Edition rating was 10.22% whole person permanent impairment, the Fifth

Edition as written 12.19% whole person permanent impairment, and the Fifth Edition, modified 12.93% whole person permanent impairment.

Table 12 Lumbosacral Spine Impairment Ratings by Edition

Region	Third Edition, Revised (Original Rating)	Third Edition, Revised (Reviewer Rating)	Fourth Edition	Fifth Edition	Fifth Edition Modified
Mean	16.96 %WP	16.35 %WP	7.25 %WP	9.92 %WP	10.64 %WP
Median	15.00 %WP	15.00 %WP	5.00 %WP	8.00 %WP	8.00 %WP
Standard Deviation	7.34 %WP	6.80 %WP	4.76 %WP	7.61 %WP	6.83 %WP
(n=77)					

Figure 7 Lumbosacral Impairment by Edition

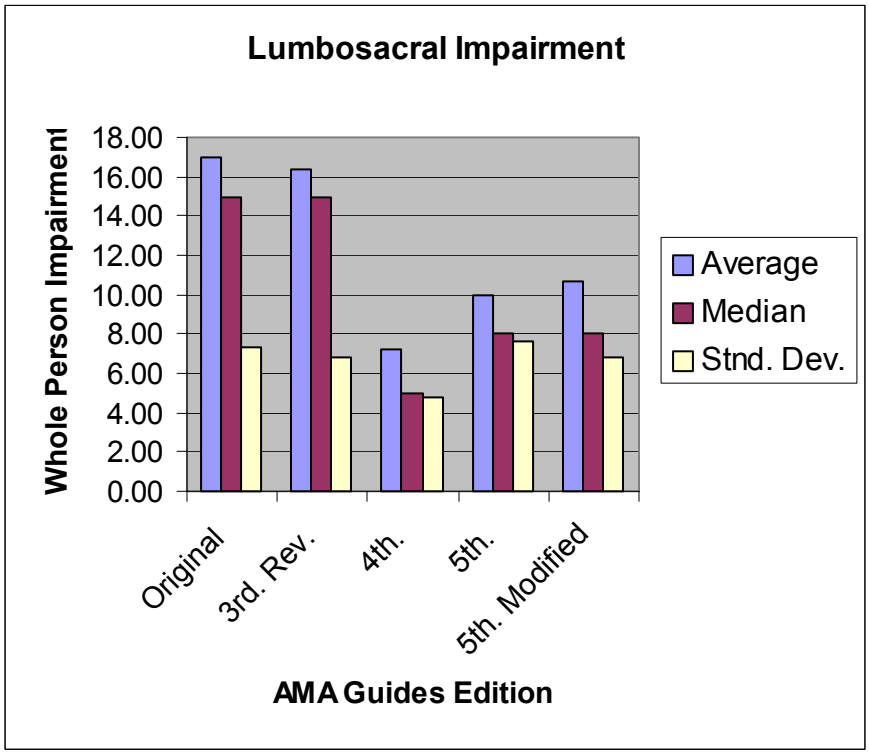


Table 13 Cervicothoracic Spine Impairment Ratings by Edition

Region	Third Edition, Revised (Original Rating)	Third Edition, Revised (Reviewer Rating)	Fourth Edition	Fifth Edition	Fifth Edition Modified
Mean	16.96 %WP	16.74 %WP	10.22 %WP	12.19 %WP	12.93 %WP
Median	16.00 %WP	16.00 %WP	5.00 %WP	8.00 %WP	8.00 %WP
Standard Deviation	7.62 %WP	7.31 %WP	6.86 %WP	10.02 %WP	9.22 %WP

(n=27)

Figure 8 Cervicothoracic Impairment by Edition

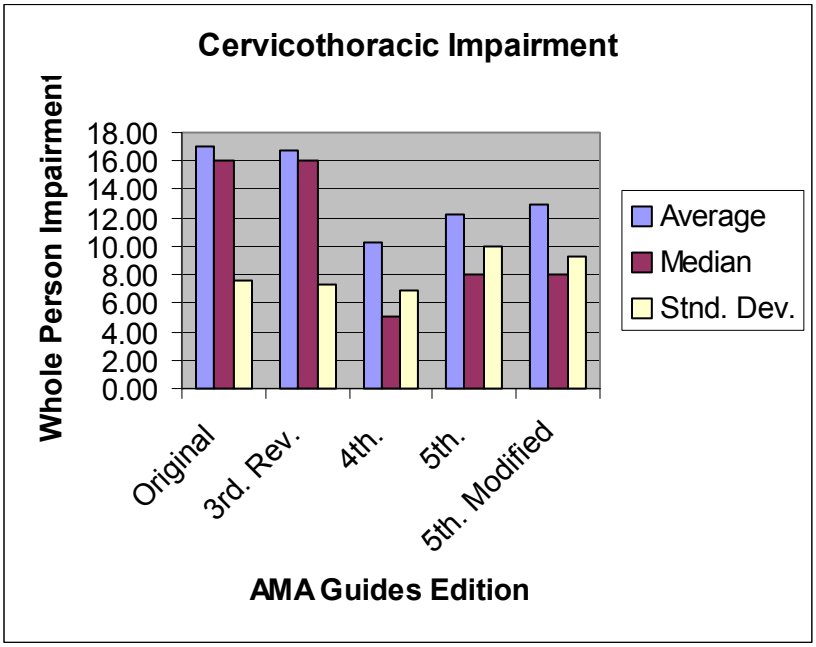


Figure 9 Comparison of Spinal Cases to Fourth Edition

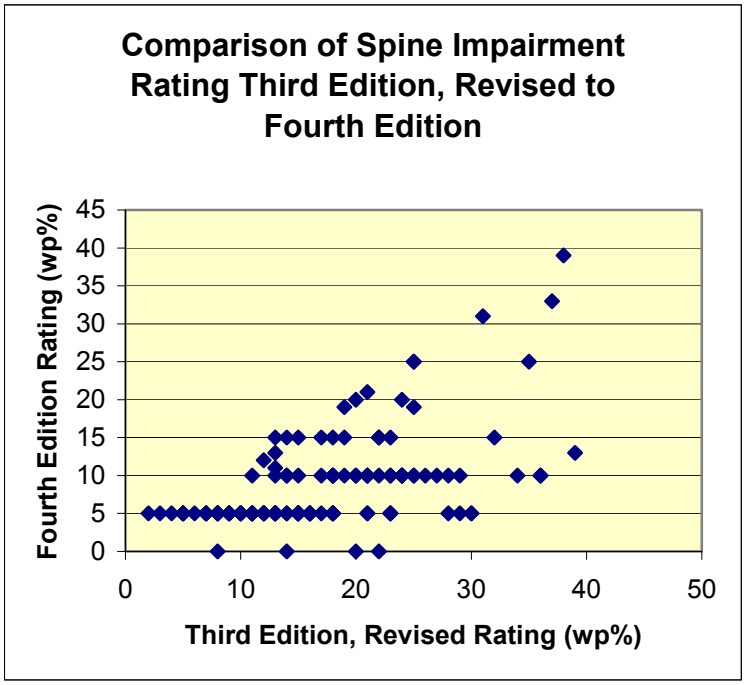


Figure 10 Comparison of Spinal Cases to Fifth Edition

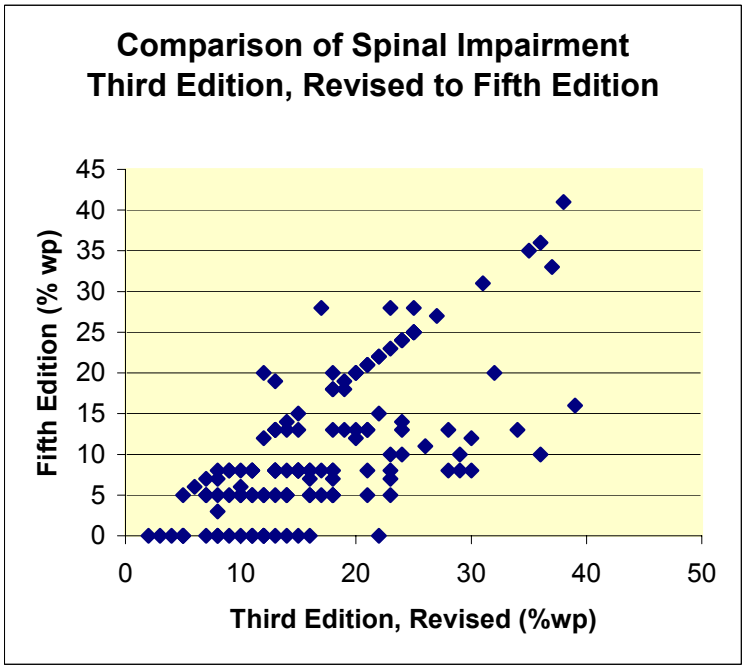
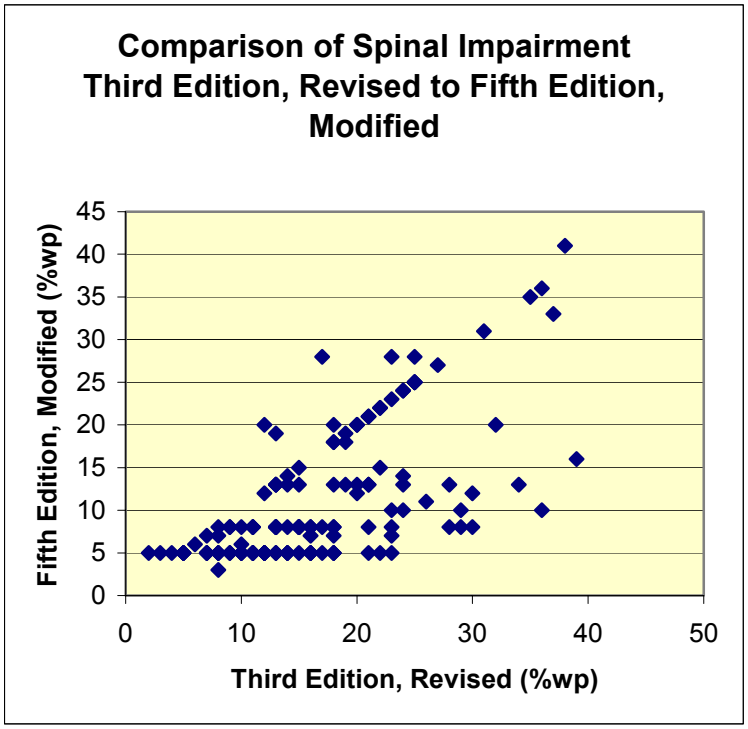


Figure 11 Comparison of Spinal Cases to Fifth Edition, Modified



Discussion

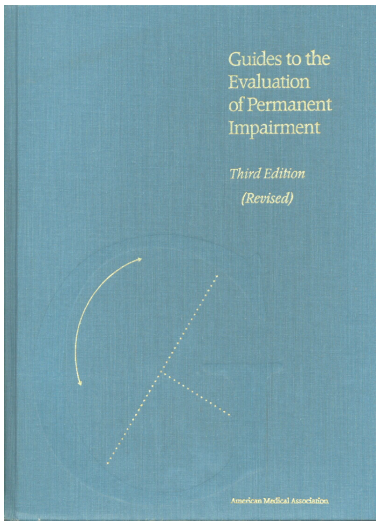
Philosophy, Purpose and Appropriate Use of the Guides

There are significant changes among the various editions of the AMA *Guides to the Evaluation of Permanent Impairment* that will impact systems that use the *Guides*, claimants, evaluators, and attorneys. To understand these changes it is appropriate to first understand the underlying philosophy and process used to assess impairment. Following this the approaches to assessing upper extremity, lower extremity, and spinal impairment are examined, incorporating a discussion of the data obtained from the study.

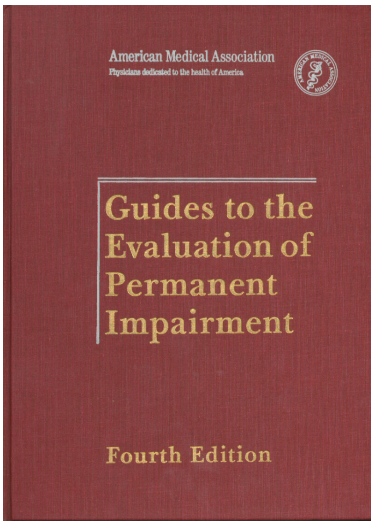
History of AMA Guides

The Guides were first published in 1971 and have undergone four revisions culminating in the Fifth Edition that was published in November 2000.

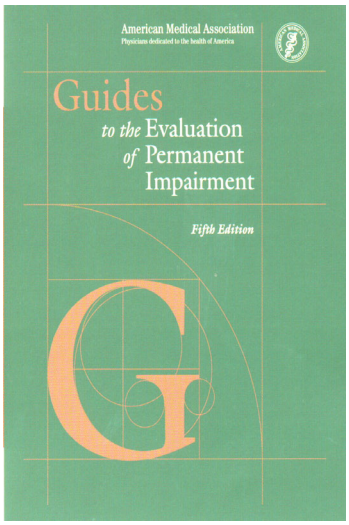
Figure 12 Guides Editions



Third Edition, Revised



Fourth Edition



Fifth Edition

The stated purpose of the Fifth Edition is to "update the diagnostic criteria and evaluation process used in impairment assessment, incorporating available scientific evidence and prevailing medical opinion" (5th ed., 1). This first printing does contain a number of errors that are to be corrected in the second printing, and have been partially addressed in an Errata sheet published in March 2002.

The Third Edition, Revised, Fourth and Fifth Editions were each Edited by different individuals.

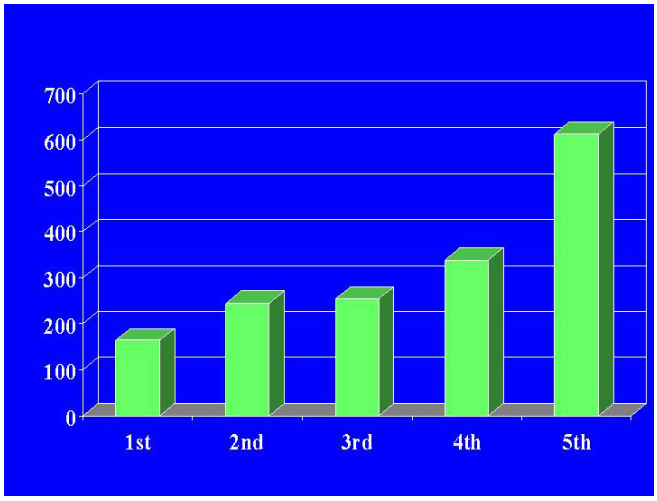
Table 14 Guides Comparison

	Third Edition Revised	Fourth Edition	Fifth Edition
Publication Date	December 1990	June 1993	November 2000
Editors	Alan L. Engelberg, MD, MPH	Theodore C. Doege, MD, MS; Thomas P. Houston, MD	Linda Cocchiarella, MD; Gunnar B. J. Andersson, MD, PhD
Pages	262	339	613
Chapters	14	15	18

Each Edition is longer. The Fourth Edition is 29% longer than the Third Edition, Revised and the Fifth Edition, is nearly two and half times the length of the Third Edition, Revised.

The growth in the size of the *Guides* is reflected in the following graphic that illustrates the number of pages per Edition.

Figure 13 AMA Guides Size (Page Count)



The changes in the chapters are reflected in the following table.

Table 15 Guides Chapters Comparison

Third Edition – Rev.	Pages	Fourth Edition	Pages	Fifth Edition	Pages
1 – Concepts of Impairment Evaluation	4	1 - Impairment Evaluation	6	1 – Philosophy, Purpose and Appropriate Use of the Guides	16
2 - Records and Reports	6	2 - Records and Reports	6	2 – Practical Application of the Guides	8
3 – The Extremities, Spine and Pelvis	92	3 - Musculoskeletal System	126	15 – The Spine 16 – The Upper Extremity 17 – The Lower Extremity	60 90 42
4 – The Nervous System	13	4 – The Nervous System	14	13 – The Central and Peripheral Nervous System	52
5 – The Respiratory System	12	5 – The Respiratory System	16	5 – The Respiratory System	30
6 – The Cardiovascular System	26	6 – The Cardiovascular System	32	3 - Cardiovascular System: Heart and Aorta 4 - Cardiovascular System: Systemic and Pulmonary Arteries	40 22
7 – The Hematopoietic System	8	7 – The Hematopoietic System	8	9 – The Hematopoietic System	22
8 – The Visual System	12	8 – The Visual System	14	12 – The Visual System	28
9 – Ear, Nose, Throat and Related Structures	12	9 – Ear, Nose, Throat and Related Structures	12	11 – Ear, Nose, Throat and Related Structures	32
10 – The Digestive System	12	10 – The Gastrointestinal Systems	14	6 – The Digestive System	26
11 – The Urinary and Reproductive Systems	14	11 – The Urinary and Reproductive Systems	14	7 – The Urinary and Reproductive Systems	30
12 – The Endocrine System	12	12 – The Endocrine System	14	10 – The Endocrine System	34
13 - Skin	12	13 - Skin	14	8 – The Skin	18
14 – Mental and Behavioral Disorders	8	14 – Mental and Behavioral Disorders	12	14 – Mental and Behavioral Disorders	16
Appendix B – Pain and Impairment	8	15 - Pain	12	18 - Pain	28
Total Length (including Appendix, Combined Values Chart and Index)	262		339		613

Alan L. Engelberg, MD, MPH served as Editor for the Third Edition, Revised, Theodore C. Doege, MD, MS and Thomas P. Houston, MD served as Editors for the Fourth Edition and Linda Cocchiarella, MD, and Gunnar B. J. Andersson, MD, PhD served as editors of the Fifth Edition. The development of each Edition was performed in conjunction with numerous organizations and individuals.

In mid-1997, Steering and Senior Advisory Committees were established to produce the most recent edition, the Fifth Edition. Some members of these committees expressed their concerns about the *Guides* and offered recommendations that were published in the Journal of the American Medical Association on January 26, 2000.[1] Their criticism focuses on two areas: internal deficiencies, including the lack of a comprehensive, valid, reliable, unbiased, and evidence-based system for rating impairments; and the way in which workers' compensation systems use the ratings, resulting in inappropriate compensation. They suggested to maintain wide acceptance of the *Guides*, its authors need to improve the validity, internal consistency, and comprehensiveness of the ratings; document reliability and reproducibility of the results; and make the *Guides* easily comprehensible and accessible to physicians.

Their primary concerns were that the *Guides* failed to provide a comprehensive, valid, reliable, unbiased and evidence-based system; impairment ratings that did not reflect loss of function; numerical ratings that represented legal fiction, not medical reality; and how the *Guides'* ratings were used. The critique's authors did recognize that the *Guides* play an essential role in rating impairment, as well as the need for a valid and reliable system for rating impairment. The authors of this article made specific recommendations:

- The *Guides* Should Provide a System to Rate Permanent Impairments, Including Functional Limitations
- Impairment Ratings Should Be Based on Scientific Evidence
- Impairment Ratings Should Be Based on a Valid Whole Person Impairment (WPI) Scale That Accurately Reflects Functional Loss
- The Impairment Ratings Should Be Reliable
- The *Guides* Should Be Comprehensive
- The *Guides* Should Be Internally Consistent
- The *Guides* Should Be Comprehensible
- The System for Ratings Should Be Accessible
- The *Guides* Should Be Acceptable

The Fifth Edition editors responded, recognizing the challenges that exist in evaluating impairment.[2] Although some shortcomings of earlier editions have been addressed in the Fifth Edition, significant problems remain with each edition. The most recent edition continues to fall short on most of these desired characteristics.

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[1] 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; 283:519-523.

[2] Cocchiarella L, Turk MA, Andersson, GBH. Improving the evaluation of permanent impairment. Recommendations to guide revision of the *Guides to the Evaluation of Permanent Impairment*. *JAMA* 2000; 283: 532-533.

Philosophy and Key Principles

The first two chapters of the *Guides* present the philosophy and key principles to assessing impairment. Therefore, it is essential for anyone using the *Guides* to understand this content prior to performing an impairment evaluation. Since many physicians appear not to be familiar with the content in these two chapters, many times the key principles and rules for evaluation are not followed.

Use of Editions of the *Guides*

Readers are advised, "It is strongly recommended that physicians use this latest edition, the fifth edition, when rating impairment" (5th ed., 2). This is similar to the statement in the Fourth Edition that "The AMA strongly discourages the use of any but the most recent edition of the *Guides*"(4th ed., 5). Yet, many workers' compensation jurisdictions mandate the use of a specific edition. This requirement is frequently specified by statute, e.g. a law that enacted and passed by the legislature. State statutes that deal with the *Guides* may or may not specify which edition of the *Guides* to use and how the *Guides* are to be utilized. In any case, it is the ultimate responsibility of the courts to interpret these statutes and determine which edition of the *Guides* is to be used, and how that edition is to be used.

Thirty-five states make use of the *Guides*, and sixty percent (twenty one) of them make use of the Fifth Edition. Eleven states use the Fourth Edition (Alabama, Arkansas, Delaware, Kansas, Maine, Maryland, Nevada, Ohio, South Dakota, Texas, and West Virginia), one state uses the Third Edition – Revised (Colorado), and one state uses the Second Edition (Louisiana). Some states do not make use of the *Guides* rather they utilize state specific guidelines; these states include California, Florida, Illinois, Minnesota, New York, North Carolina, Utah, and Wisconsin. Other states may use their own guidelines for specific problems and use the *Guides* for other problems; e.g. State of Washington rates spinal impairment using their own guidelines and extremity disorders using the *Guides*. Many states use a statutory schedule to amputations, hearing loss, visual loss, hernias, and disfigurement. Some states may use a statutory schedule and use the *Guides* for non-scheduled injuries. State-by-state use is summarized in the Appendix. The International Association of Industrial Accident Boards and Commissions has a committee to looking at the various problems with the AMA Guides.

Permanent impairment ratings using the *Guides* are also commonly performed in personal injury and automobile casualty cases and in federal systems. In these jurisdictions the most recent edition serves as the standard. Therefore, in the State of Colorado the Third Edition, Revised is used to rate cases within the jurisdiction of the state's workers' compensation system, however the Fifth Edition is used to rate personal injury, automobile casualty, Longshore and Harbor Workers, and certain federal workers' compensation cases

Impairment Definition

Impairment is defined as "the loss of, loss of use of, or derangement of any body part, system or function" in the three editions (3rd ed Rev., 244; 4th ed., 315, 5th ed., 2). The Third Edition, Revised states that impairment is "an alteration of an individual's health status that is assessed by medical means" and it is "what is wrong with a body part or organ system and its functioning" (3rd ed Rev., 1). Impairment is defined as a condition that interferes with an individual's ability to perform activities of daily living (ADL) in the Fourth Edition, however not in the Fifth Edition. The Fifth Edition notes that impairment may lead to functional limitations or the inability to perform activities of daily living. If a impairment does not interfere with an activity of daily living it is not ratable. If it does interfere, it qualifies for an impairment rating.

Activities of Daily Living

Activities of daily living are specified in the Third Edition, Revised in Appendix A: Glossary (3rd ed. Rev., 243), in the Fourth Edition in a Table in the Glossary (4th ed., 317) and in the Fifth Edition in Chapter 1 as Table 1-2 (5th ed., 4) and include self-care, communications, physical activity, sensory functions, nonspecialized hand activity, travel, sexual function and sleep. The categories of "normal living postures" and "ambulation" were replaced in the Fourth and Fifth Editions by the term "physical activity." ADL no longer includes social activities or recreational activities in the Fifth Edition. The differences in ADLs are summarized in the following table:

Table 16 Activities of Daily Living Comparison

	Third Edition Revised	Fourth Edition	Fifth Edition
Self care and personal hygiene	X	X	X
Communication	X	X	X
Normal living postures	X		
Ambulation	X		
Physical activity		X	X
Sensory functions		X	X
Travel	X	X	X
Nonspecialized hand activities / Hand functions	X	X	X
Sexual function	X	X	X
Sleep	X	X	X
Social and recreational activities	X	X	

Maximum Medical Improvement

Impairment is considered permanent when it has reached maximum medical improvement (MMI), meaning it is well-stabilized and unlikely to change substantially in the next year with or without medical treatment. MMI is defined in the Fifth Edition as the "date from which further recovery or deterioration is not anticipated, although over time there may be some expected change." (5th ed., 19). Colorado defines MMI as:

> "Maximum medical improvement" means a point in time when any medically determinable physical or mental impairment as a result of injury has become stable and when no further treatment is reasonably expected to improve the condition. The requirement for future medical maintenance which will not significantly improve the condition or the possibility of improvement or deterioration resulting from the passage of time shall not affect a finding of maximum medical improvement. The possibility of improvement or deterioration resulting from the passage of time alone shall not affect a finding of maximum medical improvement." 8-40-201 (11.5):

In the Fourth Edition, impairment was also considered permanent if it was unlikely to change by more than 3% in the next year; this definition was not present in the Third Edition Revised or the Fifth Edition.

The reference to "usually 12 months" (3rd ed. Rev., 6) is not present in the Fourth or Fifth Editions. The Third Edition, Revised states the "medical condition is static and well stabilized" (3rd ed. Rev., 6).

Basis for Assessing Impairment

The *Guides* emphasizes objective assessment, necessitating a medical evaluation. Impairment may lead to functional limitations or the inability to perform activities of daily living (ADLs) and reflects a change from normal or "pre-existing" status. Anatomic loss refers to measurable loss of a body structure or organ system, whereas functional loss refers to change in function. Normal refers to a range of zone that represents healthy functioning; it varies with age, gender and other factors. Some chapters place a greater emphasis on either anatomic loss or functional loss, and the *Guides* have evolved in the approaches used. For example, with the Fourth Edition functional assessment approaches were introduced to assess lower extremity impairment and diagnosis-related estimates, based in part on function, were introduced to assess spinal impairment.

The Fifth Edition states impairment criteria are designed to "provide a standardized method for physicians to use to determine medical impairment" and "were developed from scientific evidence as cited and from consensus of chapters authors or of medical specialty societies" (5th ed., 4) Although the *Guides* uses objective and scientifically based data when available, the degree of impairment often remains based on the clinical experience and consensus of the contributors, as it has been in the preceding Editions. This is particularly the case for the musculoskeletal system, e.g. the area of primary usage for the *Guides*.

Normal Definition

The Fifth Edition explains that normal is defined from either an individual or a population perspective, depending on the preinjury or preillness information that is available and the physician's clinical judgment. This is a more specific definition than preceding editions. Normal for the individual may be determined by comparison to preinjury or preillness status or, for example, comparison of an injured extremity to the contralateral uninjured extremity. The extremity cases reviewed typically did not document findings, such as range of motion, for the opposite side. This clarification of normalcy is a significant change from the Third Edition Revised and the Fourth Edition.

The *Guides* advises "where population values are not available, the physician should use clinical judgment regarding normal structure and function and estimate what is normal for the individual based on the physician's estimate of the individual's preinjury or preillness condition" (5th ed., 2). The Fifth Edition states that" if an individual has previous measurements of function that were below or above average population values, the physician may discuss that prior value and any subsequent loss for the individual, as well as compare it to the population normal" (5th ed., 4). In the State of Colorado apportionment is by rule limited to situations where there is actual data that can establish the individual's baseline. The directives in the Fifth that allow comparison to the opposite side would likely reduce the amount of motion impairment given to some extremity injuries. (p. 2, 5th edition last paragraph)

Impairment Not Synonymous with Disability or Work Interference

The Fifth Edition states impairment percentages are "consensus-driven estimates that reflect the severity of the medical condition to which the impairment decreases an individual's ability to perform common activities of daily living (ADL), excluding work"(5th ed., 4). This explicit exclusion for work is new and could be problematic since some workers' compensation jurisdictions commonly use impairment rating as a proxy for inability to work. The Fifth Edition states work is not included in the clinical judgment for

impairment because it involves many activities, is highly individualized, work and occupations change, and impairment interacts with other factors such as the worker's age, education, and prior work experience to determine the extent of occupational disability. The Third Edition, Revised was not as explicit, stating "an individual who is 'impaired' is not necessarily 'disabled. . . . An individual who is able to meet a particular set of demands is not 'disabled', even if a medical condition shows impairment." (3rd ed. Rev., 2).

Disability was defined in the Third Edition, Revised as "the limiting loss or absence of the capacity of an individual to meet personal, social or occupational demands, or to meet statutory or regulatory requirements" (3rd ed. Rev., 244). Similar definitions appear in subsequent editions, e.g. disability is "an alteration of an individual's capacity to meet personal, social, or occupational demands or statutory or regulatory requirements because of an impairment" (4th ed., 2; 5th ed., 8). In the Fifth Edition there is discussion of the use of the term *activity limitations* as opposed to *disability,* avoiding the stigma and labeling associated with the former, and emphasizing the person's residual ability.

Although such ratings are not direct determinates of occupational disability, the Fifth Edition states it is "appropriate for a physician knowledgeable about the work activities of the patient to discuss the specific activities the worker can and cannot do, given the permanent impairment" (5th ed., 5). Similar discussion of employability was present in the Third Edition, Revised on pages 2 and 3.

Although the Third Edition, Revised explains that impairment and disability are not synonymous, in the Fourth Edition the following statement was introduced, the only statement in bold in the *Guides:*

> **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 (4th ed., 5).**

The comparable statement in the Fifth Edition is:

> **Impairment percentages derived from the *Guides* 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 analyses. Impairment assessment is a necessary *first step* for determining disability (5th ed., 13).**

The Fifth Edition notes "there is no validated formula that assigns accurate weight to determine how a medical condition can be combined with other factors, including education, skill, and the like to calculate the effect of the medical impairment on future employment." (5th ed., 13)

Impairment Percentages

Ratings vary from 0% to 100% whole person permanent impairment. A 0% whole person rating implies no significant organ or body system functional consequences and no limitation of the performance of common ADLs. A 90% to 100% whole person rating is intended to reflect very severe organ or body system impairment and requires the individual to be fully dependent on others for self-care, approaching death. This spectrum is the same among the Editions. The Fifth Edition, however, has several inconsistencies regarding the relative ranges, particularly among the chapters dealing with organ systems.

Impairment percentages in the Editions for specific clinical measurements have not changed dramatically, with some notable exceptions; for example, percentages associated with lower extremity motion deficits. Changes in impairment values for specific injuries are more the result of changes in methodologies and principles. The Fourth Edition introduced new models for assessing spinal and lower extremity impairment that significantly impacts how evaluations are performed and the resulting impairments. This was reflected in the cases reviewed, with resultant significant decreases in the values obtained.

The Fifth Edition states that percentages are largely unchanged from the Fourth because the majority of ratings are currently accepted, there is limited scientific data to support changes, and ratings should not be changed arbitrarily. However, "some percentages have been changed for greater scientific accuracy or to achieve consistency throughout the book" (5th ed., 5). This statement, however, is inconsistent with the data, since the average rating is higher than with the Fourth Edition, however not as high as it is with the Third Edition, Revised. This is without consideration for the potential of rating for pain in the Fifth Edition. In Chapter 18, Pain, further impairment of up to 3% whole person permanent impairment for pain may be provided in certain circumstances, however Colorado statute disallows rating for pain without anatomic or physiologic correlation.

Conversion of Regional Impairments

Impairment ratings are designed to reflect the severity and limitations an organ / body system impairment and resulting functional limitations. Regional musculoskeletal impairments are provided with various weights and are converted to whole person impairments. These same conversion factors exist in all three Editions. For example, loss of a hand is equivalent to 90% upper extremity impairment, complete loss of the upper extremity is equivalent to 60% whole person permanent impairment, and complete loss of the lower extremity is equivalent to 40% whole person permanent impairment.

Combining Impairments

The process of combining numbers is the same in each of the Editions. Most impairments are not added, rather they are combined, so that multiple impairments are equal to or less than the sum of all the individual impairment values. The process of combining reflects that when considering two impairments the combined impairment is equal to the first impairment plus the second impairment as it relates to the remaining portion that is unimpaired. The values are derived from the formula A+B(1-A) where A and B are the decimal equivalents of the two ratings. To simplify the process, values are provided in the Combined Values Chart, which remains the same. The Fifth Edition recognizes that a scientific formula has not been established to indicate the best way to combine multiple impairments and that some impairments together may result in greater loss than by just adding.

In general with each of the Editions, regional impairments are combined before combining the regional impairment rating with that from another region. There are a few exceptions to combining impairments, e.g. joint impairments at the same joint, impairments of the thumb, and digit impairments reflected as hand impairments are added.

Pain and Other Subjective Complaints

Subjective complaints such as fatigue or pain, when not accompanied by demonstrable organ dysfunction, clinical signs or other independent, measurable abnormalities, are generally not ratable in any of the Editions. These not ratable disorders would include fibromyalgia, chronic fatigue syndrome and multiple chemical sensitivity. The Fifth Edition is very clear that these disorders do not result in ratable impairment. A significant change with the Fifth Edition is that pain may be ratable if there is an

underlying organic cause. This is performed as outlined in Chapter 18. "If the patient appears to have pain-related impairment that has increased the burden of his or her condition *slightly*, the examiner may increase the percentage…by up to 3%." Furthermore, "If the examiner performs a formal pain-related impairment rating, he or she may increase the percentage...by up to 3%; *and*…should classify the individual's pain-related impairment into one of four categories: mild, moderate, moderately severe, or severe. In addition, the examiner should determine whether the pain-related impairment is ratable or unratable" (5th ed., 573). A pain-related impairment score can be determined; however, this is not an impairment rating.

The Third Edition, Revised provided a discussion of "Pain and Impairment" as Appendix B, however there was no ratable basis for impairment. The Fourth Edition discusses Pain in Chapter 15, however does not provide quantitative impairment for pain. Although the Fifth Edition states, "the impairment ratings in the body organ system chapters make allowance for any accompanying pain," (5th ed., 20), it does provide a mechanism for rating pain-related impairment. "If an examining physician determines that an individual has pain-related impairment, he or she will have the additional task of deciding whether or not that impairment has already been adequately incorporated into the rating the person has received on the basis of other chapters of the *Guides*" (5th ed., 570).

Currently, the Colorado Workers' Compensation statute would not allow rating in this chapter; however; the State of Colorado could choose to include impairment ratings for pain or to limit the use of Chapter 18. In that not every case would involve a rating for pain, nor for that of the maximum 3%, it is probable that the actual increase in impairment would average between 1 and 2% whole person permanent impairment. If the rating of pain was included, it would be necessary to determine if this would then reflect a whole person permanent impairment rating, or whether the pain impairment would be converted back to the extremity level. For example, if a patient had a 3% whole person permanent impairment for pain associated with an upper extremity impairment of 10%, the 3% whole person permanent impairment could potentially be converted back to 5% upper extremity permanent impairment and combined using the Combined Values Chart (5th ed., 604) resulting in a 15% upper extremity impairment. The use of Chapter 18 to rate pain does involve additional time, approximately fifteen to thirty minutes per evaluation.

Physician Judgment

The *Guides* cannot provide a framework for evaluating all conditions, including new or complex conditions. The Fifth Edition states "in situations where impairment ratings are not provided, the *Guides* suggest that physicians use clinical judgment, comparing measurable impairment resulting from similar conditions with similar impairment of function in performing activities of daily living. The physician's judgment, based upon experience, training, skill, thoroughness in clinical evaluation, and ability to apply the *Guides* criteria as intended, will enable an appropriate and reproducible assessment to be made of clinical impairment." (5th ed., 11). This approach is currently used by level II accredited physicians for areas in which there is no rating in the Third Edition, Revised. The difficulty with this approach is that this results in problems with interrater reliability, since examiners will use differing judgments and biases to determine their rating.

Causation Analysis

The assessment of causation is critical to determine the extent of impairment that is attributable to a specific event. The Fifth Edition provides greater discussion of this topic and the analysis of apportionment than that provided in earlier editions. The Fifth Edition affirms the approach that prior to determining apportionment the physician must be able to first, document a prior factor, second, determine

that the current permanent impairment is greater a result of the prior factor, and finally determine that the prior factor caused or contributed to the impairment.

Limited guidance on apportionment was provided in the Third Edition, Revised and the Fourth Edition. In the Fifth Edition "Changes in Impairment from Prior Ratings", Section 2.5h, provides a clearer discussion of apportionment. For example, "the physician should assess the current state of the impairment according to the criteria in the *Guides* if an individual received an impairment rating from an earlier edition and needs to be reevaluated because of a change in the medical condition, the individual is evaluated according the latest information pertaining to the condition in the current edition of the *Guides*" (5th ed., 21). If the Fourth or Fifth Edition is used for ratings it will be necessary to reevaluate since it is likely that there will be cases where the injury was clearly aggravated and should have greater impairment, however the actual current impairment now would be less that given for the prior impairment by the Third Edition, Revised. The Colorado Level II Physician's Accreditation course teaches that apportionment can only be done after the physician creates a pre-injury rating using the same edition as the post injury rating.

Practical Application of the Guides

The second chapter of each edition describes how to use the *Guides* for "consistent and reliable acquisition, analysis, communication, and utilization of medical information through a single set of standards." (5th ed., 17). In the Third Edition, Revised and Fourth Editions Chapter 2 is entitled "Records and Reports" and in the Fifth Edition it is entitled "Practical Applications of the Guides". The goal for each of the Editions is that two physicians following the methods defined in the *Guides* should reach similar conclusions. Each edition also states, "If the clinical findings are fully described, any knowledgeable observer may check the findings with the *Guides* criteria." (3rd ed. Rev., 5; 4th ed., 7, 5th ed., 17) This statement also served as a basis for the appropriateness of critiquing the cases in this study.

Impairment Evaluations

The Fifth Edition contrasts impairment evaluations and independent medical evaluations. This was not done in previous editions. Impairment evaluation is defined in Section 2.1 of the Fifth Edition as a "a medical evaluation performed by a physician, using a standard method as outlined in the *Guides* to determine permanent impairment associated with a medical condition" (5th ed., 18). A treating physician or a nontreating physician may perform impairment ratings. An independent medical evaluation is performed by a physician who does not provide care for the individual. Independent medical evaluations are usually more comprehensive. In Colorado the treating physician or an independent examiner may perform evaluations. Although one may argue that the treating physician may be more familiar with the patient, physicians rating impairment on an occasional basis are usually less familiar with complexities of the rating process.

The Fifth Edition also states "impairment evaluations are performed by a licensed physician" (who) "may use information from other sources such as hearing results obtained from audiometry by a certified technician. However, the physician is responsible for performing a medical evaluation that addresses medical impairment in the body or organ system and related systems" (5th ed., 18). Thus, an estimate of impairment is a medical opinion formulated by a licensed physician, not by another licensed professional, such as physical therapist. This is the same philosophy throughout the various editions of the *Guides*. It is important for the examiner to assure the validity and reliability of the data used. For example, a

physician should verify the reliability of range of motion measurements obtained by a therapist and used in the rating process.

There is new discussion in the Fifth Edition about the performance of evaluations. Section 2.3 discusses the role and responsibilities of the impairment evaluator, which include understanding regulations applicable to workers' compensation or personal injury evaluations, providing the necessary medical assessment to the party requesting the examination with the examinee's consent, and ensuring the examinee understands the evaluation is for assessment not treatment. The statement that the "physician's role in performing an impairment evaluation is to provide an independent, unbiased assessment of the individual's medical condition including its effect on function, and identify abilities and limitations to performing activities as listed in Table 1-2". This could raise questions about whether a treating physician is "independent, unbiased" in rating his / her patient. In addition, the Fifth Edition states, "if new diagnoses are discovered, the physician has a medical obligation to inform the requesting party and individual about the condition and recommend further medical assessment" (5th ed., 18). This statement has interesting implications, since it does not establish clear boundaries between an evaluating and consultative role.

The Fifth Edition states "generally, the organ system where the problems originate or where the dysfunction is the greatest is the chapter to be used for evaluating impairment" (5th ed., 19). It also states "whenever the same impairment is discussed in different chapters, the *Guides* tries to use consistent impairment ratings across the different organ systems." There are however inconsistencies between chapters in the Fifth Edition, to a greater extent than existed with the Third Edition, Revised and Fourth Editions. For example, with the Fifth Edition, there are significant inconsistencies in the rating of reflex sympathetic dystrophy (RSD), causalgia, and complex regional pain syndrome (CRPS), dependent on whether the rating is performed using Chapter 13, The Central and Peripheral Nervous System, Chapter 16, The Upper Extremities, or Chapter 18, Pain. Anytime there are inconsistencies, such as with CRPS, it is probable that there will be more litigation.

Rules for Evaluations

Rules for the evaluation have become more explicit in each subsequent edition. The Third Edition, Revised provided limited discussion of this in Chapter 2, Records and Reports. This was expanded in the Fourth Edition, in the same chapter, with a new section, 2.2 Rules for Evaluations (4th ed., 9-10). In the Fifth Edition, Section 2.5 Rules for Evaluations provides key content relating to: confidentiality; combining impairment ratings; consistency; interpolating, measuring and rounding off; pain, using assistive devices in evaluations; adjusting for effects of treatment or lack of treatment; and for changes in impairment from prior ratings. The Fifth Edition now also includes a discussion of confidentiality, specifying "prior to performing an impairment evaluation, the physician obtains the individual's consent to share the medical information with other parties that will be reviewing the evaluation" (5th ed., 19).

Consistency is a critical issue in the rating of impairment, for if clinical examination data is either invalid or unreliable the rating will be erroneous. The Fourth and Fifth Editions recognize that "if in spite of any observation or test result, the medical evidence appears insufficient to verify that an impairment of a certain magnitude exists, the physician may modify the impairment rating accordingly and then describe and explain the reason for the modification in writing." (5th ed., 19). The Third Edition, Revised provides limited guidance on interpolation and rounding. The ratings reviewed were inconsistent in terms of interpolations, some cases provided for interpolation of range of motion measurements and in other cases only the nearest number, usually the largest, was used. The Third Edition, Revised and Fourth Edition

provide erroneous advise that that "a final impairment percentage . . .may be rounded to the nearer of the two nearest values ending in '0' or '5'" (3rd ed. Rev., 6; 4th ed., 9). This statement was deleted from the Fifth Edition. None of the cases reviewed rounded ratings to the nearest value ending in '0' or '5'.The Colorado Level II Physician's Accreditation course does not recommend rounding whole numbers.

Report Standards

Each edition provided a discussion of the need for a clear, accurate and complete report. In the Third Edition, Revised (Section 2.3) and the Fourth Edition (Section 2.4) the three steps were: medical evaluation, analysis of findings, and comparison of the analysis results with the impairment criteria. In the Fifth Edition, Section 2.6 Preparing Reports, is divided into three steps—clinical evaluation, calculation of impairment, and discussion of how the impairment rating was calculated. In the Fifth Edition, Section 2.6 differentiates between items included in all impairment reports (in bold) with those that are commonly found in IMEs or may be requested for inclusion (in italics). The approach used in the Fifth Edition is illustrated in the following table.

Table 17 Preparing Reports

	Essential for All Impairment Reports	***Additional Items Commonly Found in IMEs***
Clinical Evaluation (2.6a)	**Narrative history (2.6a.1)** **Current clinical status (2.6a.3)** **Diagnostic studies (2.6a.4)** **MMI (2.6a.5)** **Diagnoses, impairments (2.6a.6)** **Discuss impairment rating criteria, prognosis, residual function, and limitations (2.6a.8)**	*Work history (2.6a.2)* *Causation and apportionment (2.6a.7)* *Discuss complex activities such as work (2.6a.8)* *Analyze job tasks and work ability (2.6a.8)* *Explain any need for restrictions or accommodations (2.6a.9)*
Calculate the Impairment Rating (2.6b)	**Compare the medical findings with the impairment criteria**	
Discuss How the Impairment Rating Was Calculated (2.6c)	**Include explanation of each impairment value (2.6c.1)** **Include a summary list of impairments and ratings (2.6c.2)**	

Upper Extremity Impairment

In comparing the three editions, in terms of the assessment of musculoskeletal impairment, the changes to upper extremity impairment assessment have changed the least. In this study, the differences among the three editions were small, overall the average corrected rating for the Third Edition, Revised was 11.8% upper extremity impairment, the Fourth Edition rating was 10.8% upper extremity impairment (92% of the Third Edition rating), and the Fifth Edition was 11.2% upper extremity impairment (95% of the Third Edition rating).

The primary approach to assessing upper extremity impairment is primarily anatomic in each of the Editions, although functional approaches for strength loss are used in certain situations in the Fourth and Fifth Editions. The most significant changes in the Fifth Edition compared to the Fourth Edition are the more rigorous standards for upper extremity evaluation, the recommendation to compare motion findings to the contralateral extremity, entrapment neuropathies evaluation, and strength assessment.

Physicians may, in accordance with page 52 of the Third Edition, Revised, appropriately increase the rating at their discretion if they feel the measured rating does not match the severity of the clinical findings. The Fifth Edition does not provide the same directives, however, for example Chapter 16, The Upper Extremities, states "hand dominance should be considered in the determination of disability. If the examiner feels that hand dominance has a significant impact on the ability to perform activities of daily living, this can be discussed in the impairment evaluation report along with the resulting impairment rating. Hand dominance, of course, may be significant when assessing disability. . . If the total combined whole person impairment does not seem to adequately reflect the actual extent of alteration in the individual's ability to perform activities of daily living, this should be noted." (5th ed., 435).

Clinical Assessment

The principles of clinical assessment are essentially unchanged among the three editions. The Fifth Edition, however, emphasizes in Section 16.1b "Impairment Evaluation: Documentation and Recording" that "(e)valuation of the upper extremities requires a sound knowledge of the normal functional anatomy and would be incomplete without assessment of the general condition of the whole person. It must be thorough and should include several elements: status of activities of daily living; careful observations; both local and general physical examinations; appropriate imaging evaluation; laboratory tests; and preferably, a photographic record. (5th ed., 434) These "standards" presented are more comprehensive than what typically has been included in an upper extremity impairment evaluation report using the Third Edition, Revised and Fourth Editions. There have been minor changes in the "Upper Extremity Impairment Evaluation Record" that should be completed, especially for digit and hand ratings.

Rating Process

The principles of evaluating amputation, sensory loss of the digits, evaluating abnormal motion, and adding / combining values remain the same in the three editions. In the Fifth Edition, Section 16.1c (5th ed., 438-440) clarifies the process of combining. Items must be combined at the unit (e.g., finger or thumb) before converting to the next larger unit (e.g., hand). If the evaluator must combine three percentages, the two lowest values are combined first. The evaluator then combines their combined value with the third. In most cases, however, the same final percentage will be obtained whether one begins combining the largest or smallest values. In the Third Edition, Revised, the Fourth Edition, and the Fifth

Edition upper extremity impairments are added for motion deficits at the same joint, thumb joint motion impairments, and total hand impairment derived from the converted hand impairment for each digit. In the Fifth Edition, thumb amputations proximal to the metacarpophalangeal joint level are given a 37% to 38% upper extremity (not digit or hand) impairment according to the level, and this percentage is added to any other upper extremity impairment (5th ed., 440, 442, 444).

There are no substantial changes in rating upper extremity amputation among the Editions, except in the Fifth Edition where for thumb amputations proximal to the MP joint are added to any other upper extremity percentage. Amputations are relatively rare; only 2 of the 250 cases study resulted in an amputation.

The process of rating digital nerve lesions is similar in all three editions. The Fifth Edition, however, in Section 16.3 "Sensory Impairment Due to Digital Nerve Lesion" differentiates sensation and sensibility and includes a more detailed discussion of assessment. New to the Fifth Edition is a process for rating impairment due to digital neuromas. The severity of pain is graded using Table 16-10, Determining Impairment of the Upper Extremity Due to Sensory Deficits or Pain Resulting from Peripheral Nerve Disorders (5th ed., 482). A percentage selected from the range for the appropriate grade is multiplied by the maximum digit impairment for the digital nerve under the columns for total longitudinal loss (ulnar or radial) in Table 16-6 or 16-7 (5th ed., 448). No cases of digital neuromas were encountered in this study.

Range of Motion Impairment

In the Fifth Edition in Section 16.4 "Evaluating Abnormal Motion" there is more direction on how to measure motion, but the values for motion deficits remain the same as in the Third Edition, Revised and the Fourth. The Fifth Edition states "the examiner should first observe what an individual can and cannot do by asking him or her to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared" (5th ed., 451). If active motion is incomplete, assisted active and/or passive motion measurements are made. However, "Measurements of active motion take precedence in the Guides." New to the Fifth Edition are instructions permitting apportionment of diminished joint motion. "If a contralateral 'normal' joint has a less than average mobility, the impairment value(s) corresponding to the uninvolved joint can serve as a baseline and are subtracted from the calculated impairment for the involved joint" (5th ed., 453). "A loss of motion in a zone beyond normal values does not as a rule represent a loss of function or impairment" (5th ed., 454). "In rare cases…an impairment percent not to exceed 2% of the maximum regional impairment value of a unit of motion could be given", if the contralateral joint is hypermobile and the affected joint has a comparative loss of motion.

Peripheral Nervous System Impairment

There are changes in rating peripheral nerve impairment, as presented in the Third Edition, Revised in Section 3.1h (3rd ed. Rev., 39-46), the Fourth Edition Section 3.1k (4th ed., 46), and the Fifth Edition Section 16.5 (5th ed., 480-495). The most significant of these with the Fifth Edition are: grading sensory deficits, rating entrapment neuropathies, and evaluating complex regional pain syndrome.

In the Fifth Edition, there are significant discrepancies between this chapter and Chapter 13, "The Central and Peripheral Nervous System," and Chapter 16, "The Upper Extremities." Sensory grading is reversed in the Fifth Edition upper extremity chapter compared to the upper extremity section in Chapter 3 of the Third and Fourth Editions and Chapter 13 of the Fifth. The descriptions and values for sensory deficit or pain grades have been slightly modified in each Edition, with the Fifth Edition containing more extensive explanation regarding grading. The descriptions and values for motor deficits are also slightly different

among the three editions, and the Fifth Edition Table 16-11 (5th ed., 484) contains more extensive explanation regarding grading. It is probable that these changes will result in some confusion. "The examiner must use clinical judgment to estimate the appropriate percentage…within the range of values shown for each severity grade. The maximum value is not applied automatically" (5th ed., 482). The Fifth Edition also acknowledges the wide range of weakness included in grade 4, from minimal to severe, and indicates it "…should be rated from 1% to 25% depending on the degree within this grade" (5th ed., 484). Colorado's Level II Physician's Accreditation course teaches physicians to choose a number within an available grading range which best matches the patient's impairment of activities of daily living.

The values assigned for maximum upper extremity loss due to a nerve injury have changed somewhat over the three editions, as illustrated by values for the median and ulnar nerve below the forearm in the following table. The rationale for these changes is not provided.

Table 18 Examples of Maximum Impairments for Deficits of Median and Ulnar Nerves

	Third Edition, Revised	Fourth Edition	Fifth Edition
Table	Table 14 (46)	Table 15	Table 15-15 (492)
Median Nerve – Sensory	40 %UE	38 %UE	39 %UE
Median Nerve – Motor	35 %UE	10 %UE	10 %UE
Ulnar Nerve – Sensory	10 %UE	7 %UE	7 %UE
Ulnar Nerve – Motor	25 %UE	35 %UE	35 %UE

Therefore, for example a patient with a carpal tunnel syndrome who was graded as having a 60% sensory deficit and a 12% motor deficit would have a 27% upper extremity impairment per the Third Edition, however would have a 24% impairment per the Fourth Edition.

Table 19 Comparison of Median Nerve Impairment Ratings

	Third Edition, Revised	Fourth Edition	Fifth Edition
Table	Table 14 (46)	Table 15 (54)	Table 15-15 (492)
Median Nerve – Sensory Impairment	24 %UE	23%UE	23 %UE
Median Nerve – Motor Impairment	4%UE	1%UE	1%UE
Combined Impairment	27%UE	24%UE	24%UE

The Third Edition, Revised provided an example on pages 37 and 38 of a patient with an injury to his elbow that resulted in minor causalgia over the medial aspect of the right forearm, however does not explicitly state there was a nerve injury. The individual was rated for "decreased sensation or pain", however Table 10 (3rd ed. Rev., 40) states the criteria is "decreased sensation with or without pain", e.g. there must be decreased sensation. In that example the individual was given a sensory impairment of 4% upper extremity impairment, however this would not occur with subsequent editions which require an objective neurological deficit. In a similar manner, an example is provided on page 38 of an individual who sustained a shoulder injury and had weakness on abduction. This was rated as if there was an axillary nerve injury, however there was not. With this example 7% upper extremity impairment was given for

the weakness, however this would not be ratable in the Fourth Edition. In the Fifth Edition it may be ratable, if there are no range of motion deficits, using Table 16-35 (5th ed., 510).

The Third Edition, Revised and the Fourth Edition offer two means for rating entrapment neuropathies, the method applicable to all peripheral nerve disorders (based on the a sensory and motor grading of the maximum loss for a nerve) and the use of an entrapment table, in the Third Edition, Revised this being Table 15 (3rd ed. Rev., 46) and in the Fourth Edition Table 16, (4th ed., 57). Although the entrapment table is simpler to use, ratings depended on whether the entrapment was considered mild, moderate, or severe; and no criteria were listed for these three categories. Hence inter-rater reliability is low. For this and other reasons, no equivalent Table appears in the Fifth Edition; and examiners are instructed to rate entrapment neuropathies like any peripheral nerve disorder. The Colorado Level II Physician's Accreditation course does not recommend use of the entrapment table.

To minimize duplicative ratings, the new edition specifically states, "In compression neuropathies, additional impairment values are not given for decreased grip strength" (5th ed., 494). In the Fifth Edition, if a patient has a carpal tunnel release, and has no objective findings post release there is no ratable impairment, unless this person has post operative abnormal electrodiagnostic studies in which case a rating of up to 5% upper extremity impairment may be given. In this study only two cases of carpal tunnel syndrome, e.g. median nerve entrapment, were encountered, therefore no statistical significance can be given to differences in ratings.

Complex Regional Pain Syndrome

The Third Edition, Revised did not provide a separate discussion of how to rate reflex sympathetic dystrophy – RSD (complex regional pain syndrome - CRPS, Type 1). This is a controversial diagnosis that first requires confirmation that there is underlying physical pathophysiologic, as opposed to a subjective report of marked pain in an extremity. Most evaluators would rate this in the Third Edition, Revised using Section 4.1b The Spinal Cord (3rd Rev., 106-108) via a functional approach The Colorado's Level II Physician's Accreditation course recommends use of the spinal cord table for CRPS Type 1. In the Fourth Edition section on Causalgia and reflex sympathetic dystrophy (RSD) (4th ed., 56) ratings were done by combining impairment due to loss of motion, pain or sensory deficits and motor deficits. In the Fifth Edition this section has been re-titled Complex Regional Pain Syndromes (CRPS), Reflex Sympathetic Dystrophy (CRPS I), and Causalgia (CRPS II) (5th ed., 495-497). Both the Fourth and Fifth Editions emphasize that manifestations of peripheral nerve lesions such as diminished motion, atrophy, and reflex changes are taken into account in the impairment assessment. It is noted in the Fifth Edition that CRPS I (RSD) can cause motion loss or other changes not due strictly to a peripheral nerve lesion. Different processes for rating CRPS are provided in Chapter 13, "The Central and Peripheral Nervous System," and Chapter 18, "Pain." Chapter 13 contains a new Section 13.8 "Criteria for Rating Impairments Related to Chronic Pain." This retains the older terminology for these conditions (RSD and causalgia). It also provides a different method for rating them, depending on ability to perform activities of daily living and whether the dominant or nondominant limb is involved (5th ed., 343). A third approach to rating CRPS is presented in Chapter 18. These inconsistencies in the Fifth Edition are likely to be problematic for the rating physician and provide opportunities for ratings to be challenged.

Impairment Due to Other Disorders

There are several changes in assessing impairment due to other disorders, as explained in the Third Edition, Revised in Section 3.1j (3rd ed., Rev., 48 – 54), Fourth Edition in Section 3.1m (4th ed., 58-65), and Fifth Edition in Section 16.7 (5th ed., 498 – 507). There were relatively minor differences between the Third Edition, Revised and the Fourth Edition, with the notable exception of arthroplasty (including in

subsequent sections impairment for distal clavicle resection). If a patient had shoulder surgery limited to an acromioplasty, impairment is based on range of motion deficits in all three editions The Colorado Level II Physicians Accreditation curriculum instructs physicians to rate distal clavicle resection per the 4th edition section 3.1m.

In the Fifth Edition, the most noteworthy changes for other disorders are more explicit directions, the elimination of rating for joint crepitation, inclusion of new radiographic criteria for rating carpal instability, and introduction of a new process for rating shoulder instability. A common error in rating shoulder impairment with the Third Edition, Revised and the Fourth Edition was to combine impairment due to motion deficits and crepitation, despite explicit advise to the contrary. The statement if an examiner determines that the estimate for the anatomic impairment does not sufficiently reflect the severity of the patient's condition, the examiner may increase the impairment percent that appeared in the Third Edition, Revised on page 52 and in the Fourth Edition on page 63 does not appear in the Fifth Edition.

Cumulative Trauma Disorders

The Third Edition, Revised does not explicitly discuss the issue of cumulative trauma disorders such as tendonitis (with the exception for constrictive tenosynovitis), other than to say "if the impairment rating is being given for cumulative trauma disorders, it is suggested that the evaluation take place after the individual has worked for 6 to 8 hours." (3rd ed. Rev., 14). This statement is problematic particularly if the patient is not working and does not appear in subsequent editions. The Fourth Edition discusses cumulative trauma disorders and states an individual whose symptoms are reduced by alteration of daily activities or work tasks "should not be considered to be permanently impaired" (4th ed., 19). This instruction is absent in the successor edition. However, a similar statement appears in Section 16.7d Tendinitis (5th ed., 507) stating epicondylitis, fasciitis, and tendinitis "…are not given a permanent impairment rating unless there is some other factor that must be considered" (5th ed., 507). In the Fifth Edition, however, if the patient has undergone a tendon rupture or surgical releases, rating may be based on grip strength loss. It is probable that the State of Colorado will need to continue to provide an alternative approach to assessing impairment for cumulative trauma disorders.

Strength Loss

Rating based on grip or pinch strength loss are provided in each of the Editions. These are to be used "in a rare case", e.g. if the examiner believes the patient's loss of strength represents an impairing factor that has not been considered adequately. This is a problematic area, since the examiner must determine what is a "rare case", strength measurements can be influenced by a number of variables, and measurements may be neither valid nor reliable.

The discussion of strength evaluation is expanded in the Fifth Edition in Section 16.8, and a process for rating weakness of shoulder and elbow motions is now provided. Strength deficits for the shoulder and elbow are obtained from clinical assessment and based on ranges derived from unit of motion values. The ratings are presented in Table 16-35, "Impairment of the Upper Extremity Due to Strength Deficit from Musculoskeletal Disorders Based on Manual Muscle Testing of Individual Units of Motion of the Shoulder and Elbow" (5th ed., 510). A rating for weakness could be combined with other impairments, but only if due to an unrelated cause. The Fifth Edition states strength loss "cannot be rated in the presence of decreased motion, painful conditions, deformities, or absence of parts." Such a list of exclusions makes it unlikely an examiner would be able to justify a strength loss rating. This is a problematic area and likely to lead to disputes and to litigation.

Upper Extremity Summary

In summary, the most significant changes from the Third Edition, Revised are the need for a more detailed assessment (including measurements of the opposite side) and the processes for rating reflex sympathetic dystrophy (complex regional pain syndrome) and "other disorders. It is probable that evaluators would have little difficulty in making the transition from the Third Edition, Revised if they were made aware of the above differences. It is also probable that ratings will take more time if the standards for documentation and evaluation are followed. It is probable that there will be controversy and the potential for increased litigation over the assessment of complex regional pain syndrome and strength loss, unless the Division of Workers' Compensation supplies specific instructions for rating these areas.

Lower Extremity Impairment

In this study, the average rating overall was 18.0% lower extremity impairment with the Third Edition, Revised and 13.9% lower extremity impairment (e.g. 77% of the value) with the Fourth and Fifth Editions. The ratings with the Fourth and Fifth Editions are identical since there has been no change in the rating process. The differences between the Third Edition, Revised and Fourth / Fifth Edition approaches were more significant with the knee (18.1% vs. 12.9%) than with the ankle (17.2% vs. 17.4%).

Third Edition, Revised Approaches

Lower extremity impairment in the Third Edition, Revised is discussed in Section 3.2 The Lower Extremity (3rd ed. Rev., 55-78). Impairment in the Third Edition Revised is based primarily on range of motion deficits, amputation (Table 47, 3rd ed. Rev., 73), other disorders of the knee (Table 40, 3rd ed. Rev., 68) or hip (Table 45, 3rd ed. Rev., 72), peripheral nervous system deficits (Table 51, 3rd ed. Rev., 77), or peripheral vascular disorders (Table 52, 3rd ed. Rev., 79). Since most of the ratings were of the knee, impairment was based primarily on range of motion deficits and Other Disorders of the Knee (Table 40, 3rd ed. Rev., 68). Whereas range of motion deficits result in a specific rating of impairment based on a specific finding, Other Disorders of the Knee provides ranges of impairment that requires significant physician judgment.

Fourth and Fifth Edition Approaches

In the Fourth Edition in Section 3.2 (4th ed., 75 – 93) and Fifth Edition in Chapter 17, The Lower Extremities (5th ed., 523 – 564) thirteen different method means are used to assess impairment. There are anatomic, diagnostic, and functional approaches. This permits the examiner to match the approach to each patient's physical impairment, with usually a single method being selected. This is a fundamental change from the Third Edition, Revised. There are only relatively minor differences between the Fourth and Fifth Editions. The Fifth Edition provides clarification when the different evaluation methods should be used, and provides a new table "Guide to the Appropriate Combination of Evaluation Methods" (Table 17-2) and a lower extremity worksheet that may be used a template to simplify making the assessment and recording the evaluation. Both of the Editions contain a number of minor errors, particularly in terms of the case examples.

Each subsequent edition provides more direction on what should occur during the evaluation. In the Fifth Edition the components of the history and a lower extremity physical examination are provided in Section 17.1, Principles of Assessment (5th ed., 524-525). The physician records lower extremity-related physical findings, such as range of motion, limb length discrepancy, deformity, reflexes, muscle strength and atrophy, ligamentous laxity, motor and sensory deficits, and specific diagnoses such fractures and bursitis. Section 17.2, "Methods of Assessment" (5th ed., 525-554) explains the methods of assessment in further detail than provided in Section 3.2 of the Fourth Edition. Anatomic changes, including range of motion, limb length discrepancy, arthritis, skin changes, amputation, muscle atrophy, nerve impairment, and vascular derangement are assessed in the physical examination and supported with clinical studies. Specific fractures and deformities are usually evaluated by diagnosis-based estimates. This methodology tends to be objective, reliable, and specific. Diagnosis-based estimates are also commonly used for ligamentous instability, bursitis, and various surgical procedures. Functional methods, such as range of motion, gait derangement, and muscle strength, are assessed last, since they are generally not as objective, reliable or specific as other approaches.

The Third Edition, Revised and Fourth Edition do not provide a worksheet. The Colorado Level II Physician's Accreditation curriculum provides a required Lower Extremity Worksheet appropriate for the 3rd Revised Edition. The Fifth Edition provides Figure 17-10 (5th ed., 561) to record abnormal motion, and as guidance to most common regional impairments with corresponding Tables.

Usually, one method will adequately characterize the impairment and its impact on the ability to perform ADL. If more than one method can be used, the method that provides the higher rating should be adopted. In some cases more than one method needs to be used to accurately assess all features of the impairment. The cross-usage chart, Table 17-2. Guide to the Appropriate Combination of Evaluation Methods (5th ed., 526) is new to the Fifth Edition and provides guidance on what can and cannot be combined. The evaluator should explain in writing why a particular method(s) to assign the impairment rating was chosen. This provides the opportunity to be more discerning in evaluating impairment, however also may result in controversy.

It is probable there will be some initial confusion for physicians use to the Third Edition, Revised, especially for common scenarios such as rating a patient who has had a partial menisectomy and has deficits of knee range of motion. In the Third Edition, Revised both would be rated, however in the Fourth and Fifth Editions only one approach would be rated. Physicians will need to be reminded to obtain all applicable data, for example with the knee, range of motion, measurement of strength, measurement of circumferences, and review of x-rays, and that typically only a single approach is used. For example, not all patients with a partial medial menisectomy may have the same functional loss; e.g. one patient may have a good functional result whereas another patient develops significant problems with quadriceps weakness and atrophy.

Combining Impairments

The Fifth Edition now explains if there are multiple impairments involving different regions of the lower extremity (e.g., thigh and foot) these impairments are combined as a whole person value. If there are multiple impairments within a region (e.g., the toes and the ankle) these are first combined as regional impairments than converted to whole person. Impairment values in the Chapter 17 are unchanged from those in Fourth Edition in Section 3.2.

Limb Length Discrepancy

Limb length discrepancy is ratable in the Fourth and Fifth Editions. In the Fifth Edition in Section 17.2b Limb Length Discrepancy" (5th ed., 528) there is a statement that in the case of shortening due to overriding or malalignment or fracture deformities, but not including flexion or extension deformities, a value of up to 20% of the lower extremity (for a discrepancy of 3.75 to 5.0 cm) is combined with other functional sequelae. If leg length discrepancy was recorded in all cases without respect to the work related injury, ratings might be inflated due to pre-existing conditions. Ratable impairment must be causally related to an injury, and limb length discrepancy due to an injury is a rare event, typically limited to a significant fracture.

Gait Derangement

Section 17.c, "Gait Derangement" (5th ed., 529) is essentially unchanged from the Fourth Edition, an approach not provided in the Third Edition, Revised. However, to emphasize this is not the preferred method for assessing impairment the statement "*whenever possible, the evaluator should use a more specific method*" is now italicized; and the evaluator is advised, "when the gait method is used, a written rationale should be included in the report."

Muscle Weakness and Atrophy

The Third Edition, Revised did not provide a mechanism for rating for muscle atrophy or muscle weakness unless there was a peripheral nerve injury; this is provided in subsequent editions, and may be significant factor relating to functional loss and impairment. In the Fifth Edition, Section 17.2d, Muscle Atrophy (Unilateral) (5th ed., 530) explains that "the method that most accurately and objectively reflects the individual's impairment" should be used. When there is atrophy of both the thigh and leg (calf), the impairments are determined separately and the whole person impairment is combined. Section 17.2e, Manual Muscle Testing (5th ed., 531) is unchanged from the Fourth Edition. It is noted that atrophy is not used in assessing upper extremity impairment. Weakness due to pain behavior or unsupported by objective findings is not ratable.

Range of Motion

The values for range of motion deficits are generally lower in editions subsequent to the Third Edition, Revised. Rather than providing specific impairments for range of motion deficits, impairments are given for categories of mild, moderate, and severe. For example, differences in lower extremity impairment for the knee for flexion are illustrated in the following table:

Table 20 Comparison of Knee Flexion Lower Extremity Impairment

Degrees of Knee Flexion	Third Edition, Revised	Fourth or Fifth Edition Classifications	Fourth or Fifth Edition Classifications
150 – 120	0% - 11% LE	(Normal)	0% LE
110 – 80	14% - 25% LE	Mild	10% LE
70 – 60	28% - 32% LE	Moderate	20% LE

Section 17.2f, "Range of Motion (5th ed., 533) notes, "If it is clear to the evaluator that a restricted range of motion has an organic basis, three measurements should be obtained and the greatest range measured should be used." Findings that are inconsistent by a rating class between two observers, by the same observer on separate occasions, are considered invalid. Guidance is provided in the Fifth Edition on how to approach range of motion deficits in multiple directions in the same joint. These values are *added* to determine the total joint range of motion impairment. In the Fifth Edition 17.2g, "Joint Ankylosis" (5th ed., 538) advises the "values listed [in the tables] are for the maximum end of the deformity range," and "Specific deformities should be rated using interpolation of the ranges in the tables…." By contrast, with joint motion deficits a range of values is included in one class having a single impairment estimate without interpolation.

Arthritis

In the Third Edition, Revised there was not a separate discussion for arthritis; rather this was included in Table 40. Impairment Ratings of the Lower Extremity For Other Disorders of the Knee (3rd ed. Rev., 68) as disorder "5. Arthritis due to any etiology, including trauma; chondromalacia" with an impairment range of 0 to 20% lower extremity. Without specific criteria on where to place a patient in a range there are problems with inter-rater reliability. In the Fourth Edition in Section 3.2g Arthritis (4th ed., 82 – 83) and the Fifth Edition in Section 17.2h, Arthritis roentgenographic grading is used as a more objective and valid method for assigning impairment estimates than physical findings, such as range of motion or joint crepitation.

Amputation

There are minor differences in assessing impairment from amputation, e.g. comparing Table 47 (3rd ed. Rev., 73) to subsequent editions. For example amputation below the knee with a functional step results in a 70% lower extremity impairment with all three editions, however an amputation at the ankle (Syme) results in a 70% lower extremity impairment with the Third Edition, Revised however with the Fourth and Fifth Editions results in a 62% lower extremity impairment.

Diagnosis-Based Estimates

"Diagnosis-Based Estimates" are common approach to assessing impairment in the Fourth and Fifth Editions. Table 17-33 Impairment Estimates for Certain Lower Extremity Impairments (5th ed., 546-547) is identical to the Fourth Edition Table 64. Impairment Estimates for Certain Lower extremity impairments (4th ed., 85-86). These tables provide many more impairments for specific conditions, organized by condition.

They are more explicit than those provided in the Third Edition, Revised in Table 40. Impairment Rating of the Lower Extremity For Other Disorders of the Knee (3rd ed. Rev., 68). For example in the Third Edition, Revised if there was one meniscus injury the rating was up to 10% lower extremity, however with subsequent editions a partial meniscectomy is rated at 2% lower extremity and a total menisectomy is rated at 7% lower extremity. Another example is for knee replacement, with the Third Edition, Revised the directions are "20%, if in optimal position". In subsequent editions a point system is used to rate the results of knee replacement and impairment is based on the quality of the result: good (85 – 100 points) 37% lower extremity, fair (50 – 84 points) 50% lower extremity, and poor (less than 50 points) 75% lower extremity. These changes will reduce problems with inter-rater reliability.

The Fourth and Fifth Editions however do not specifically address diagnosis based estimates for full thickness articular cartilage defects, ununited osteochondral fracture, ACL repair without laxity, or severe cavus deformity of the foot. New to the Fifth Edition is the last sentence prior to the example on page 549. "A diagnosis of isolated full-thickness articular cartilage defects and ununited osteochondral fractures [sic] requires arthroscopic or surgical confirmation." However, there is no listing for chondral defect in Table 17-33, Impairment Estimates for Certain Lower Extremity Impairments (5th ed., 546). The table lists various intra-articular fractures, but not osteochondral fractures per se. Reportedly an omitted instruction was to rate these conditions as mild arthritis per Table 17-31, Arthritis Impairments Based on Roentgenographically Determined Cartilage Intervals (5th ed., 544). Presumably the evaluating physician would select the first rating listed for each joint, e.g., from the 3 mm column for sacroiliac, hip, knee, patellofemoral, and ankle joints, the 2 mm column for subtalar joint, and the 1 mm column for the midfoot and toe joints listed.

Peripheral Nerve

The Third Edition provided in Table 51 (3rd ed. Rev., 77) impairments for peripheral nerve injuries, in terms of maximum loss due to sensory and motor deficit. The Fourth and Fifth Editions provide impairments for fewer nerves; however also provide impairment for dysesthesia, in Table 68 (4th ed., 89) and Table 17-37 (5th ed., 552). Examples of the differences are provided in the following table.

Table 21 Comparison of Lower Extremity Peripheral Nerve Impairments (maximum)

Nerve	Third Edition, Revised Sensory	Fourth and Fifth Editions, Sensory	Fourth and Fifth Editions, Dysesthesia	Third Edition, Revised Motor	Fourth and Fifth Editions, Motor
Femoral	5 %LE	2 %LE	6 %LE	35 %LE	37 %LE
Sciatic	25 %LE	17 %LE	12 %LE	75 %LE	75 %LE
Common Peroneal	5 %LE	5 %LE	5 %LE	35 %LE	42 %LE
Tibial (above knee)	15 %LE	Not included	Not included	Not included	Not included

Specific guidance on how to approach both sensory and dysesthesia deficits in the same individual are not offered either in the text or case examples in the Fourth or Fifth Editions. The evaluator is advised to grade sensory, dysethsia and motor deficits. The grading for both sensory and dysthesia components is not consistent with approaches used in the Nervous System and Upper Extremity chapters, therefore the examiner should state why one or both approaches were used. These deficits are graded only when there is objective evidence of a nerve injury. The Fourth Edition references three components to peripheral nerve injuries: motor deficits, sensory deficits, and dysesthesia. The Fifth Edition mentions only two components, the motor and sensory deficits, but nevertheless still lists separate ratings for dysesthesia in Table 17-37, Impairments Due to Nerve Deficits (5th ed., 552). Example 13-46, 5% Impairment Due to Mononeuropathy in the Lower Extremity (5th ed., 348) in Chapter 13, The Central and Peripheral Nervous System, presents a case of a mononeuropathy of the Peroneal Nerve with sensory, dysesthesia, and motor losses, however the dysthesia component is not rated.

Complex Regional Pain Syndrome

The Third Edition, Revised does not provide a discussion of how to rate reflex sympathetic dystrophy – RSD (complex regional pain syndrome - CRPS, Type 1). This is a controversial diagnosis and one likely to result in litigation, as previously discussed. The Colorado Level II Physician's Accreditation curriculum provides guidance in this area as previously mentioned. In the Fourth Edition, Section 3.2l Causalgia and Reflex Sympathetic Dystrophy (4th ed., 89) advises that this condition should be rated as for the upper extremity. In the Fifth Edition, Section 17.2m, Causalgia and Complex Regional Pain Syndrome (Reflex Sympathetic Dystrophy)" (5th ed., 553) states "the evaluator should use the method described in Chapter 13, The Central and Peripheral Nervous System". However, earlier Chapter 17 states, "causalgia and complex regional pain syndrome (reflex sympathetic dystrophy) are evaluated using a combination of ROM and peripheral neurologic evaluation techniques" (5th ed., 525). This advice is contrary to that provided in Section 13.9 (5th ed., 343), which does not use the term "complex regional pain syndrome", and rates impairment based on functional classes, not on range of motion and peripheral neurological findings.

Peripheral Vascular Disorders

Peripheral vascular disorders are addressed in the same manner in each of the editions, e.g. Table 52 (3rd ed. Rev., 79), Table 69 (4th ed., 89), and Table 17-38 (5th ed., 534) are comparable.

Lower Extremity Summary

In summary, the process of assessing lower extremity impairment is fundamentally different in the Fourth and Fifth Editions compared to the Third Edition, Revised. This will result in significant differences in impairment rating values, and will require physicians to learn a new approach. A common knee injury scenario can exemplify these changes. An individual sustains an acute knee injury and undergoes a partial medial meniscectomy. At the time of the arthroscopy arthritic changes are noted, however his joint space intervals for his knee are 4 mm. At the time of the evaluation, the only "abnormal" finding is knee flexion of 130 degrees. By the Third Edition, Revised for the range of motion findings and Table 39 (3rd ed. Rev., 68) there is 11% lower extremity impairment. It is probable that per Table 40 (3rd ed. Rev., 68) he would be rated at 5% lower extremity for his meniscectomy and another 5% for his arthritis. The combined impairment is 20% lower extremity impairment. Per the Fourth and Fifth Editions, there is no ratable impairment for flexion 130 degrees, nor is there impairment for the arthritis. Since range of motion was normal impairment would be 3% lower extremity, based on the Diagnosis-Estimates Method and a partial medial menisectomy.

Lower extremity impairment ratings will typically be lower with the Fourth and Fifth Editions than they were with the Third Edition, Revised. It is probable that physicians will have a tendency to combine multiple methodologies as they did with the Third Edition, Revised when they should be selecting a single methodology in most cases. Examinations will take greater time since more approaches need to be considered and more measurements must be obtained. It is also probable that there will be controversy over the choice of the methodology, and at times whether more than one methodology should have been used.

Spine Impairment

Spinal impairment evaluations are the most frequent type of evaluation performed. There are significant differences in spinal impairment rating among the *Guides* Third Edition Revised, and Fourth and Fifth Editions. Spinal evaluation is described in the Third Edition, Revised in Section 3.3, The Spine (3rd ed. Rev., 78 – 101), the Fourth Edition in Section 3.3, The Spine (4th ed., 94 – 135), and in the Fifth Edition in Chapter 15, The Spine (5th ed. 373 – 431).

The impairment estimate for a spinal injury may be quite different depending on which edition is used to rate the condition. In this study, the average spinal rating was 17.1% whole person permanent impairment with the Third Edition, Revised and 8.6% whole person permanent with the Fourth Edition. With the Fifth Edition the average rating is between 10.7% and 11.5% whole person permanent impairment, dependent on whether the cases were interpreted conservatively or not. Values were significantly less with both the Fourth and Fifth Editions, although more dramatically with the Fourth Edition.

In this study, the greatest differences were seen with the lumbar spine reflecting the significance of range of motion measurements as a major determinant of impairment in these cases. The average lumbar impairment was 16.5% whole person permanent impairment with the Third Edition, Revised, 7.3% whole person permanent impairment with the Fourth Edition, and 10.1% whole person permanent impairment with the Fifth Edition. These differences are consistent with what would be expected when the methods used for rating spinal impairment are examined.

An effective way to understand the changes is to rate exemplary cases per the instructions and methods of each edition. The following table "Summary of Spinal Impairment Criteria by Edition" summarizes the rating criteria used in these three editions.

In the Third Edition, Revised the Range of Motion Method (ROM) is used, in the Fourth Edition the Diagnosis-Related Estimates (DRE) method is used in nearly all cases, and in the Fifth Edition both methods are used, dependent on the case.

Table 22 Summary of Spinal Impairment Criteria by Edition

	Third Edition Revised	Fourth Edition	Fifth Edition
Diagnosis Related Methods		**Injury (DRE) Model**	**Diagnosis-Related Estimates Method**
Table of Categories		Table 72. DRE Lumbosacral Spine Impairment Categories (4th ed., 110)	Table 15-3. Criteria for Rating Impairment for Lumbar Spine Injury (5th ed., 384)
Table Changes from Previous Edition			Category II includes radiculopathy with positive imaging study, now resolved. Category III includes surgery for radiculopathy but now asymptomatic. Category IV includes fusions as well as loss of motion segment integrity. Categories VI – VIII are deleted. Each category has a range of 4% based on outcome.
Range of Motion Model			
Table - Specific Spine Disorders	Table 53. Impairments Due to Specific Disorders of the Spine (3rd Rev., 80)	Table 75. Whole-person Impairment Percents Due to Specific Spine Disorders (4th ed., 113)	Table 15-7. Criteria for Rating Whole-Person Impairment Percent Due to Specific Disorder to Be Used as Part of the ROM Method (5th ed., 404)
Table Changes from Previous Edition		III. Spondylolysis and spondylolisthesis, not operated on, values are 1% less. IV. Separates decompression (values 1% less) and fusion	No change
Table - Impairment Due to Abnormal Motion of the Lumbosacral Region – Flexion / Extension	Table 60. (3rd ed. Rev., 98)	Table 81. (4th ed., 81)	Table 15-8 (5th ed., 407)
Table Changes from Previous Edition		Straight leg raise invalidity changed	None
Table – Impairment Due to Abnormal Motion of the Lumbosacral Region – Lateral Flexion	Table 61. (3rd ed Rev., 98)	Table 82. (4th ed., 130)	Table 15-9 (5th ed., 409)
Table Changes from Previous Edition		None	None
Table – Unilateral Spinal Nerve Root Impairment Affecting the Lower Extremity	Table 49. (3rd ed Rev., 76)	Table 83. (4th ed., 130)	Table 15-18 (5th ed., 424)
Table Changes from Previous Edition		None	None

Third Edition, Revised

The Third Edition Revised only uses what was subsequently labeled the Range of Motion (ROM) Model or Method to assess impairment. Ratings are based on the combined value of whole person impairments due to: (1) specific disorders of the spine, (2) ankylosis or abnormal motion in the spinal area, and (3) any spinal cord or nerve root injury with neurologic impairment (3rd ed. revised, 80). Physician judgment is required in determining what disorder to assign. Although usually it is evident what is the appropriate disorder, at times there may be controversy, for example whether a situation should be classified "none to minimal" or "moderate to severe" degenerative changes. Many of the specific disorders and the results of range of motion measurements reflect congenital, developmental, or age-related conditions, e.g. problems that are not directly related to the injury.

Range of Motion

Range of motion measurements (ROM) are performed using inclinometers. These measurements must be valid and reliable, and some questions about these issues were raised in this study. If measurements were obtained by a physical therapist they must be confirmed by the examining physician. When straight leg raising was extremely limited, under twenty degrees, questions should be raised about the validity of these determinations, e.g. are these valid or do they reflect the subjective experience of the examinee and are supine straight leg raising findings consistent with sitting straight leg raising. The sacral validity test, where measurements of sacral motion are compared to straight leg raising results, is used to determine if lumbar flexion was valid. A study published in December 2001 concluded "Technical complications inherent in the ROM-based impairment-rating model render the validity checks difficult to perform satisfactorily and thus rarely used."[3] The researchers found under normal conditions of range of motion measurement, 33% of three consecutive lumbar flexion and 27% of three consecutive lumbar extension measurements failed the L validity check. In addition, across three different experimental sessions (each with more than three consecutive lumbar range of motion measurements taken) only 15 participants (33%) had valid flexion scores and only 24 participants (53%) had valid extension scores across all three sessions.

The table for assessing impairment due to specific disorders of the spine changed slightly in the Fourth Edition (4th ed., 113). The values listed for Disorder III in Table 75, "Spondylolysis and spondylolisthesis, not operated on", are one percent less than in the preceding edition. Disorder IV, "Spinal stenosis, segmental instability, spondylolisthesis, fracture or dislocation, operated on", provided separate listings for single level decompression and fusion, the values for single level decompression of cervical or lumbar spine being for the most part one percent less than in the Third Edition, Revised. The instructions for combining changed in wording but not intent. Diagnosis-based impairment estimates were to "…be combined with range of motion…and…whole-person impairment estimates involving sensation, weakness, and conditions of the musculoskeletal, nervous, or other organ systems."

In the Fifth Edition, Table 15-7 (5th ed., 404) has the same values as Table 75 from the Fourth. Again, diagnosis-based and physical examination-based (mobility and neurologic) impairment percents are combined. As illustrated in Table D-9, there have been no changes between these three editions in values for the two examination-based components of the ROM Model, spinal motion and neurological deficits.

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[3] Zuberbier OA Commentary on the American Medical Association guides' lumbar impairment validity checks. ***Spine***, 26(24): 2735-7, 2001.

Fourth Edition

The Fourth Edition introduced the Injury or Diagnosis-Related Estimates (DRE) Model. This relies on the history, physical examination findings (particularly neurologic deficits but not spinal motion), and results of diagnostic testing (radiographic, electrodiagnostic, cystometrographic, etc.). It attempts to document anatomical and physiological impairments relating to injury (in particular) or disease, rather than congenital, developmental, or age-related conditions. The Fourth Edition comments on the frequency of these findings:

(1) Spondylolysis, found normally in 7% of adults;
(2) Spondylolisthesis found in 3%;
(3) Herniated disk without radiculopathy, found in more than 30% of individuals by age 40 years, and
(4) Aging changes, common in 40% of adults after age 35 years. (4th ed., 100)

In the Fourth Edition, the Range of Motion Model had a very limited role, e.g. that of a differentiator when it was unclear in which category a patient should be placed and when the process is due to illness, rather than an injury (e.g., is not within the workers' compensation arena). The Fourth Edition states on page 100:

> With the Injury Model, surgery to treat an impairment does not modify the original impairment estimate, which remains the same in spite of any changes in signs or symptoms that may follow the surgery and irrespective of whether the patient has a favorable or unfavorable response to treatment. (4th ed., 100)

Hence clinical findings at the time of a later impairment assessment are usually irrelevant with regard to rating. Although this greatly simplifies the rating process, improves inter-rater reliability, and permits rating promptly after an injury, it is often an inadequate approach to assessing impairment in settings where the ultimately impact of an injury must be fairly addressed. This directive however is contrary to the usual approach with workers' compensation statutes that the rating must reflect the impairment of the individual at the time of maximum medical improvement. This approach also fails to provide a continuum of impairments. For example, with nearly all lumbar injuries there are only three values assigned: 0% if there are complaints and no objective findings (DRE Lumbosacral Category I), 5% if there are objective findings without radiculopathy (DRE Lumbosacral Category II), and 10% if there are objective findings of radiculopathy (DRE Lumbosacral Category III). If the problem was due to an injury, e.g. the most common presumed problem in the workers compensation setting, no patient will have a rating of 1% - 4%, 6% - 9%, or greater than 10% whole person permanent impairment.

Fifth Edition

While the Fifth Edition retains both spinal rating techniques, they are now called methods rather than models. The DRE Method remains the principal means to evaluate an individual having an injury, but there are changes in when and how it is used. Impairment is rated only when an individual has reached maximum medical improvement (MMI); and the choice of a category is often based on findings at the time of the rating examination. The ROM Method is used to assess impairment not caused by an injury, when there is multilevel involvement (multilevel radiculopathy, multilevel compression fractures and multilevel alteration of motion segment integrity (such as fusions) in the same spinal region, when there is recurrent radiculopathy caused by a new or recurrent disc herniation, and when there are multiple pathologic episodes producing alteration of motion segment integrity and/or radiculopathy. (5th ed., 380).

The need to determine which method to use can result in controversy and litigation. In the Fifth Edition, the term "loss of motion segment integrity" now includes surgical fusion, whereas with the Fourth Edition it was limited to certain measurement findings.

Examples of Ratings

The following presents seven exemplary cases that demonstrate the differences in impairment ratings between the three editions. This is based on an article published in the January – February 2001 *Guides Newsletter*.[4] In each case a common clinical scenario is provided, and then rated by each of the editions.

Table 23 Spinal Impairment Evaluation Examples by Edition

Clinical Scenario	Third Edition Revised	Fourth Edition	Fifth Edition
Low back injury with mild ongoing lumbalgia Medically documented low back injury with slightly decreased lumbar motions but no guarding or neurologic deficit on exam shortly after injury. X-rays revealed minimal degenerative disease. At MMI complains of soreness with heavy lifting but normal examination.	0 - 5% ROM Model Table 53. II.A. = 0% Table 53. II.B. = 5% ("medically documented injury and a minimum of six months of medically documented pain and rigidity with or without muscle spasm)	0% Injury Model Table 72. DRE Category I (No documented guarding.)	0% DRE Method Table 15-3. DRE Category I (No objective findings upon examination at MMI.)
Low back injury with guarding. Medically documented low back injury with decreased lumbar motions and guarding but no neurologic deficit on exam shortly after injury. Imaging studies revealed minimal degenerative disease. At MMI reports soreness with heavy lifting. Exam normal except for minimal lumbar motion deficits (true flexion 45°, sacral flexion 45°, true extension 20°, and normal lateral extension)	9% ROM Model Table 53. II.B. = 5%, combined with 4% for motion deficits per Table 60. (2% flexion + 2% extension)	5% Injury Model Table 72. DRE Category II (Rating based on history of documented guarding.)	0% DRE Method Table 15-3. DRE Category I (No objective signs at time of rating examination. This assumes the motion deficits are not due to guarding.)
Low back injury with radiculopathy, resolved with conservative therapy. Medically documented low back injury with guarding and a clinically significant left S1 radiculopathy on initial exam. MRI reveals a left posterolateral disk herniation at L5-S1. Treated conservatively with resolution of radiculopathy. At MMI reports soreness with heavy lifting. Exam normal except for minimal lumbar motion deficits (true flexion 45°, sacral flexion 45°, true extension 20°, and normal lateral extension)	11% ROM Model Table 53. II.C. = 7%, combined with 4% for flexion and extension deficits per Table 60. (2% flexion + 2% extension)	10% Injury Model Table 72. DRE Category III (Rating based on history of radiculopathy)	5% DRE Method Table 15-3. DRE Category II (Rating based on "had a clinically significant radiculopathy and has an imaging study that demonstrates a herniated disk at the level and on the side that would be expected based on the previous radiculopathy, but no longer has the radiculopathy following conservative treatment.)

[4] Brigham CR, Spinal Impairment Evaluation: Comparison of the Third Edition Revised, Fourth and Fifth Editions. *Guides Newsletter,* January – February 2001.

Low back injury, with radiculopathy, resolved with diskectomy. Medically documented low back injury with guarding and a clinically significant left S1 radiculopathy on initial exam. MRI reveals a left posterolateral disk herniation at L5-S1. Following diskectomy had resolution of radiculopathy. At MMI asymptomatic with normal exam except for minimal lumbar motion deficits (true flexion 45°, sacral flexion 45°, true extension 20°, and normal lateral extension)	12% ROM Model Table 53. II.E. = 8%, combined with 4% for motion deficits per Table 60. (2% flexion + 2% extension)	10% Injury Model Table 72. DRE Category III (Rating based on history of radiculopathy and not altered by surgery.)	10% DRE Method Table 15-3. DRE Category III (Rating based on "individuals who had surgery for the radiculopathy but are now asymptomatic.")
Low back injury, with radiculopathy, unresolved with diskectomy Medically documented low back injury with guarding and a clinically significant left S1 radiculopathy on initial exam. MRI reveals a left posterolateral disk herniation at L5-S1. Despite diskectomy has at MMI ongoing symptoms and is unable to do his usual recreational and some household activities. Exam reveals moderate lumbar motion deficits (true flexion 35°, sacral flexion 55°, true extension 15°, and normal lateral extension), absent Achilles reflex, decreased sensation (graded at 60%) and strength (graded at 10%) in S1 distribution.	19% ROM Model Table 53. II.E. = 10%, combined with 8% for motion deficits per Table 60. (5% flexion + 3% extension) and 2% for neurologic deficits per Table 49. (sensory 5% x 60% + motor 20% x 10% = 5% lower extremity = 2% whole person)	10% Injury Model Table 72. DRE Category III (Rating based on history of radiculopathy and not altered by surgery.)	13% DRE Method Table 15-3. DRE Category III (Rating based on radiculopathy with persistent symptoms and impact on activities of daily living)
Low back injury, with radiculopathy, unresolved with fusion. Same scenario as number 5, however, diskectomy *and* arthrodesis of L5-S1 performed with resultant solid fusion.	19% ROM Model Table 53. II.E. = 10%, combined with 8% for motion deficits per Table 60. (5% flexion + 3% extension) and 2% for neurologic deficits per Table 49. (sensory 5% x 60% + motor 20% x 10% = 5% LE = 2% WP)	10% Injury Model Table 72. DRE Category III (Rating based on history of radiculopathy and not altered by surgery.)	28% DRE Method Table 15-3. DRE Category V (Rating based on radiculopathy and alteration of motion segment integrity with persistent symptoms and impact on activities of daily living)
Low back injury, with multilevel radiculopathy, unresolved with two level diskectomy Medically documented low back injury with guarding and clinically significant L5 and S1 radiculopathies. MRI reveals herniated L4-5 and L5-S1 disks. Despite 2 level diskectomy at MMI has ongoing symptoms and is unable to do his usual recreational and some household activities. Exam reveals moderate lumbar motion deficits (true flexion 35°, sacral flexion 55°, true extension 15°, and normal lateral extension), absent Achilles reflex, decreased sensation (graded at 60%) and strength (graded at 10%) in S1 distribution. L5 radiculopathy resolved.	20% ROM Model Table 53. II.E+F. = 11%, combined with 8% for motion deficits per Table 60. (5% flexion + 3% extension) and 2% for neurologic deficits per Table 49. (sensory 5% x 60% + motor 20% x 10% = 5% lower extremity = 2% whole person)	10% Injury Model Table 72. DRE Category III (Rating based on history of radiculopathy and not altered by surgery.)	20% ROM Model Table 15-7. II.E+F. = 11%, combined with 8% for flexion and extension deficits per Table 15-8. (5% flexion + 3% extension) and 2% for neurologic deficits per Table 15-18. (sensory 5% x 60% and motor 20% x 10% = 5% lower extremity = 2% whole person) (Rating based on range of motion model since multilevel radiculopathy.)
Range of Scenarios	0 – 20% whole-person impairment	0 – 10% whole-person impairment	0 – 28% whole-person impairment
Mean Rating of Scenarios	12%	8%	11%

Example 1 – Lumbalgia

The first example involves a low back injury with residual mild, intermittent lumbalgia, but no guarding, either historically or at the time of the evaluation, no neurologic deficit, and minimal degenerative changes on x-rays. Hence there would be no impairment per the Fourth and Fifth Editions. Using the Third Edition Revised, some evaluators might decide this meets the criteria for a "medically documented injury and a minimum of six months of medically documented pain and rigidity with or without muscle spasm," and provide a rating of five percent whole person impairment per Disorder II.B of Table 53 (3rd ed revised, 80). Other evaluators would probably conclude the rigidity criterion was not met, and rate this under Disorder II.A, e.g. "unoperated, with no residual signs or symptoms", warranting zero percent whole person impairment. With the Third Edition, Revised most examiners would provide ratable impairment for a patient who had an injury and continued to have pain complaints.

Example 2 – Non-Specific Low Back Syndrome

The second example involves a low back injury with documented guarding initially. However, later examination revealed no findings other than minimal lumbar motion deficits which, rated via the ROM method, constituted four percent whole person impairment. Lacking pre-injury lumbar motion measurements as a baseline, it is difficult to determine if these deficits pre-existed or were caused by the injury. Using the Third Edition Revised there probably would be impairment ratable per Disorder II.B, i.e., five percent whole person. This would then be combined with the four percent for motion deficits resulting in nine percent whole person impairment. With the Fourth Edition, since there was documented guarding most evaluators would select DRE Category II, warranting five percent whole person impairment. However, using the Fifth Edition process there would be no ratable impairment given the absence of significant clinical findings at the time of the rating examination, unless the examiner felt the minimal motion deficits were indicative of guarding. From a practical perspective, it is recognized that one examiner may not find objective evidence on a specific day, yet fact finders may consider there to be impairment if there were consistent objective findings noted by other examiners and permanent restrictions imposed.

Range of motion deficits are common, not only from an injury, however also as the result of aging. Hypothetically, if a patient was rated as IIB and on range of motion was found to have a failed sacral validity test (e.g., flexion impairment was excluded), 10 degrees of lumbar spine extension (5% whole person permanent impairment) and 15 degrees of lateral bending in each direction (a total of 6% whole person permanent impairment), the combined impairment would be 20% whole person permanent impairment.

Example 3 – Radiculopathy, Resolved with Conservative Therapy

The remaining five examples involve radiculopathy. In the third scenario the radiculopathy resolved with conservative therapy, and at the time of permanent impairment assessment examination was normal apart from minimal lumbar motion deficits. According to the Third Edition Revised, this would be fall under Disorder II.C with a seven percent whole person impairment. Combining this with the rating for motion deficits yields eleven percent whole person impairment. This is similar to the ten percent rating that would be obtained from the Fourth Edition, this being classified as a Category III based on the history of a documented radiculopathy. However, in the Fifth Edition the rating is based upon the findings at MMI and would only be Category II (five percent whole person impairment) since this patient "had a clinically significant radiculopathy and has an imaging study that demonstrates a herniated disc at the level and on the same side that it would be expected based on previous radiculopathy, but no longer has radiculopathy following conservative treatment" (5th ed., 404).

Example 4 – Radiculopathy, Resolved with Discectomy

If the individual had a discectomy, as illustrated in the fourth example, but an excellent outcome, the Third Edition Revised rating would be slightly higher. There would be twelve percent whole person impairment based on Disorder II.D, "surgically treated disc lesion with no residual symptoms or signs" combined with the rating for the minimal lumbar motion deficits. This assumes the only residual sign, the minimally diminished lumbar motion, was due to a cause other than the low back injury. There would be ten percent whole person impairment using both the Fourth and the Fifth Editions. In the Fourth Edition this was based on the documented radiculopathy. In the Fifth Edition one of the definitions for Category III is "individuals who had surgery for radiculopathy but are now asymptomatic".

Example 5 – Radiculopathy, Persistent, s/p Discectomy

If there were ongoing radicular symptoms and signs, as illustrated in the fifth example, the impairment would be higher with the Third Edition Revised since the Disorder would drop from II.D. down to II.E and neurologic deficits would be combined into the final rating. Using the DRE approach, the rating would be Category III with both the Fourth and the Fifth Editions. However, in the Fifth Edition there is a range of values from ten to thirteen percent for Category III. Since there are persistent symptoms and signs impacting activities of daily living, the rating would probably be thirteen percent whole person impairment. Thus given a radiculopathy treated with diskectomy, and resolution of the radiculopathy, the rating is the same using the Fourth or Fifth Editions. Since the latter takes into account treatment outcomes via the three percent range, if ongoing symptoms and signs impact activities of daily living, the Fifth Edition rating would be higher. It is noted that having ranges within a category, a concept new to the Fifth Edition, is likely to result in controversy, e.g. some examiners will be more conservative and provide a number lower in the range and others will provide a number higher in the range.

Example 6 – Radiculopathy, Persistent, s/p Fusion

In the sixth clinical scenario, lumbar radiculopathy unresolved with fusion, there are significant differences in the ratings obtained from each edition, particularly between the Fourth and Fifth. Using the Third Edition Revised there would be nineteen percent whole person impairment. In the Fourth Edition "surgery to treat an impairment does not modify the original impairment estimate, which remains the same in spite of any changes in signs or symptoms that may follow the surgery and irrespective of whether the patient has a favorable or unfavorable response to treatment" (4^{th} ed., 100). Hence the rating would be DRE Category III, ten percent whole person impairment, based on the radiculopathy. The Fifth Edition rating is almost three times higher, twenty-eight percent whole person impairment. This most recent edition of the *Guides* considers fusion an alteration of motion segment integrity. Because there is also residual radiculopathy, the individual falls into DRE Lumbar Category V, representing twenty-five percent to twenty-eight percent whole person impairment. Since the residual symptoms and signs impact activities of daily living, the higher rating in the range is used, twenty-eight percent.

Example 7 – Radiculopathy, Multilevel, Unresolved with Two-Level Diskectomy

The seventh scenario is multilevel radiculopathy unresolved with a two-level discectomy. The rating using the Third Edition Revised is one percent higher than the sixth scenario, since there is a further one percent whole person impairment due to the surgery at one additional level. With the Fourth Edition, the rating remains Category III at ten percent. With the Fifth Edition, since there is multilevel involvement, it is necessary to use the Range of Motion Model. Therefore, the rating is the same as would occur with the Third Edition Revised.

Fifth Edition Paradoxes

There are also certain paradoxes that occur with the Fifth Edition in rating spinal impairment. In the Fourth Edition there were Category IV ratings that were based on loss of motion segment integrity. This is based on specific measurement results that are very rarely encountered with work-related spinal injuries. In the Fifth Edition the definition of loss of motion segment integrity was changed to include single level spinal fusions. Therefore, in the Fourth Edition a patient who had a radiculopathy and was treated with a single level fusion would be assigned a DRE Category III rating; for the lumbar spine this resulted in a 10% whole person permanent impairment and for the cervical spine a 15% whole person permanent impairment. In the Fifth Edition this would result in a lumbar impairment of 25% - 28% whole person permanent impairment (based on a DRE Lumbar Category V rating, the combined result of a DRE Lumbar Category III rating for radiculopathy and a DRE Lumbar Category IV rating for loss of motion segment integrity – the fusion) and a cervical impairment of 25% - 28% whole person permanent impairment (based on a DRE Cervical Category IV rating for the fusion). Therefore, in the Fifth Edition single level fusion ratings can result in greater impairment than that of a multilevel fusion, if the patient has minimal deficits of motion and a normal examination. For example, if a patient had a two level spinal fusion for discogenic disease with a history of radiculopathy, and had lumbar flexion and extension impairment totaling 10% whole person permanent impairment, the impairment would be based on the combined impairment of 20% whole person permanent impairment, based on an impairment from Table 15-7 (IIE/F) of 11% whole person permanent impairment combined with the 10% whole person permanent impairment for the motion deficits. This impairment is 5 to 8% whole person permanent impairment less than that associated with a lesser procedure, a single level fusion using the required category IV.

Spine Summary

In summary, spinal impairment ratings using the Third Edition Revised are higher than those obtained from the Diagnosis- Related Estimates (DRE) Model or Method. This is largely due to the inclusion of range of motion deficits that may be more reflective of aging than the injury itself. This in due in part to the fact the ROM Model or Method, the only spinal impairment rating technique available in the Third Edition Revised, rates motion deficits that may not be related to the injury in question, but instead attributable to congenital or developmental conditions, aging, and flexibility.

Many spinal ratings performed using the Fifth Edition will be higher than with the Fourth, however not as high as they were with the Third Edition, Revised. However, since the Fifth Edition takes into account treatment outcomes, the ratings for cases where there has been resolution of the symptoms and signs will often be lower than with the Fourth Edition. For example, with the Fourth Edition, a patient may receive ratable impairment even if they have no positive findings on examination at the time of the rating, as long as they were documented in the past. With the Fifth Edition, there would be no ratable impairment using the commonly used Diagnosis-Related Estimates Category. With poor treatment outcomes, the converse will likely be true, particularly since the range of ratings now provided starts with the percentages used for Fourth Edition categories and goes up by three percent. Furthermore, *loss* of motion segment integrity as defined in the Fourth Edition did not include fusions. However, in the Fifth Edition *alteration* of motion segment integrity does. The newer, more inclusive term means more patients will be rated using the higher categories IV and V. For example, lumbar radiculopathy treated with a fusion that would have been rated Category III with the Fourth Edition will now be Category V, with a rating at least one hundred and fifty percent higher. Also, injuries at more than one level in the same spinal region, including multilevel radiculopathies, as well as recurrent or bilateral radiculopathy, are now rated using the Range of Motion Model, again resulting in higher impairment ratings.

These changes in the Fourth and Fifth Edition will require training of both the evaluators and others involved in the rating process to understand the profound differences in spinal impairment evaluation. The continuing challenge in rating spinal impairment is the reliability of the whole person permanent impairment rating number. It does not appear that range of motion measurements accurately reflect function of the spine, particularly as it relates to a specific injury. Diagnosis-based estimates simplify the rating process, however a diagnosis does not necessarily correlate with functional status, such as the ability to bend, lift and carry. The Fifth Edition provides a 3% range within diagnosis-based estimates, yet this does not reflect the totality of experiences that patients may experience in terms of function. The lack of a spectrum of impairments remains in the Fifth Edition, e.g. a patient with a low back injury rated with the Diagnosis-Related Estimates method may have resultant impairment of 0%, 5 – 8%, 10 – 13%, 20 – 23%, and 25% - 28%, however no values between.

Whole Person, other than Spine, Impairment

Most impairment evaluations deal with painful disorders involving the spine, upper extremities, or lower extremities. Therefore, Chapter 3 in the Third Edition, Revised and Fourth Edition, and Chapters 15 through 18 in the Fifth Edition are used most frequently. In the Third Edition, Revised and Fourth Edition Chapters 4 through 13 deal with other organ systems, and in the Fifth Edition Chapters 3 through 13 deal with other organ systems; Chapter 14 focuses on mental and behavioral disorders. With the notable exception in the Fifth Edition of Chapter 12, "Vision", these chapters have not been fundamentally changed from the Fourth Edition. For the most part minor changes to the text and tables have been made, medical approaches have been updated, and further case examples have been included.

Cardiovascular System

In the Fifth Edition, the cardiovascular system is now presented in two chapters, Chapter 3, "The Cardiovascular System: Heart and Aorta" and Chapter 4, "Cardiovascular System: Systemic and Pulmonary Arteries", as opposed to a single chapter in the Fourth Edition, e.g. Chapter 6, "The Cardiovascular System". Chapter 3 reflects new information about valvular disease, the important prognostic impact of left ventricular function on individuals with coronary artery disease and the inclusion of silent ischemia and coronary artery spasm with regard to impairment, and information about cardiomyopathy, including the impact of HIV-related conditions on cardiac function. Chapter 4 incorporates new guidelines on hypertension and expands the section on pulmonary hypertension.

Pulmonary System

In the Fifth Edition, Chapter 5, "The Respiratory System" (also Chapter 5 in the Third Edition, Revised and Fourth Edition) was revised to include criteria for asthma impairment based on guidelines published by the American Thoracic Society and includes a section on sleep apnea. Respiratory impairment criteria in the Fifth Edition incorporate the lower limits of normal for forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), and the diffusing capacity for carbon monoxide (DCO).

Digestive System

Chapter 6, "The Digestive System" in the Fifth Edition is similar to Chapter 10 in the Third Edition, Revised and Fourth Edition, however changes in impairment ratings have occurred to reflect improvements in treatment, e.g., permanent impairment for ulcer disease has essentially been eradicated due to new treatment approaches. There is more consistency among impairments as they relate to impact on the ability to perform activities of daily living. Weight loss is an essential criterion.

Urinary and Reproductive Systems

In the Fifth Edition, Chapter 7, "The Urinary and Reproductive Systems" (Chapter 11 in the Third Edition, Revised and Fourth Edition) includes revisions of criteria for upper and lower urinary tract impairment, the process for rating bladder impairment by incorporating results of urodynamic studies, and reproductive system sections. All the tables were revised to eliminate overlap in ratings.

Skin

Chapter 8, "Skin" provides the same approach to rating impairment as Chapter 13, Skin in the Third Revised and Fourth Edition. New sections on contact dermatitis and natural rubber latex allergy are provided.

Hematopoietic System

Chapter 9, "Hematopoietic System" (Chapter 7 in the Third Edition, Revised and Fourth Edition) is similar to the previous editions, however there is a new Table providing a functional classification of hematologic disease and there are expanded sections on human immunodeficiency virus (HIV) and thrombotic disorders.

Endocrine System

Chapter 10, "Endocrine System" updated from the previous Chapter 12 descriptions of endocrine gland function and nomenclature of test procedures and of disease entities, including diabetes mellitus. The criteria for percentage of impairment have remained the same.

Ear, Nose, Throat and Related Structures

Chapter 11, "Ear, Nose, Throat, and Related Structures" (Chapter 9 in the Third Edition, Revised and Fourth Edition) added a new section on voice impairment, added a new Table on vestibular disorders, and combined facial disorders and disfigurements.

Visual System

Chapter 12, "Visual System" has been totally revised from Chapter 8 in the Third Edition, Revised and Fourth Edition. The assessment of visual system impairment is now based on a functional approach, reflected by a Functional Acuity Score (FAS) and a Functional Field Score (FFS). This chapter is designed to be used by ophthalmologists.

The Central and Peripheral Nervous System

Chapter 13, "The Central and Peripheral Nervous System" has been expanded considerably (from 12 pages in the Third Edition and 13 pages in the Fourth Edition where it appeared as Chapter 4, to 51 pages in the Fifth Edition). The fundamentals of rating conditions affecting the nervous system remain largely unchanged. There are some changes in the Fifth Edition criteria for rating impairment due to central nervous system disorders, as explained in Section 13.2, "Criteria for Rating Impairment Due to Central Nervous System Disorders" (5th ed., 308) and Section 13.3, "Criteria for Rating Cerebral Impairments" (5th ed., 309-327). Section 13.3f, "Emotional or Behavioral Impairments" now explicitly states "psychiatric manifestations and impairments that do not have documented neurological impairments are evaluated using the criteria in the chapter on mental and behavioral impairments." (5th ed., 325). Much of the expansion in Chapter 13 is due to inclusion of additional cases to illustrate each area of impairment. A new addition to this chapter is a section discussing criteria for rating impairments related to chronic pain.

Mental and Behavioral Disorders

Chapter 14, "Mental and Behavioral Disorders" continues in the Fifth Edition not to provide numeric ratings for psychological disorders; this is the same approach taken in the Third Edition, Revised and Fourth Edition in the previous Chapter 14. Therefore, if a numeric rating of impairment is required, an approach beyond the *Guides*, e.g. one similar to that currently used in the State of Colorado, is required. Revisions in the Fifth Edition include a discussion of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), removal of the discussion on social security disability, addition of more case examples, and the inclusion of a summary template of factors to be included in psychiatric assessment.

Pain

Chapter 18, "Pain" has been completely revised from the discussion of "Pain and Impairment" in Appendix B in the Third Edition, Revised and Chapter 14 in the Fourth Edition. An overview of pain and discussion regarding the complexity of assessing the impact of pain have been added in the Fifth Edition, Revised, as reflected in Section 18.1, "Principles of Assessment" (5th ed., 566) and Section 18.2, "Overview of Pain" (5th ed., 566-569). The chapter reviews situations where pain is a major cause of suffering, dysfunction, or medical intervention, rather than a part of injuries or illnesses of specific organ systems. Section 18.3, "Integrating Pain-Related Impairment Into the Conventional Impairment Rating System" (5th ed., 569-581) provides a qualitative method for evaluating impairment due to rating chronic pain. The pain of individuals with ambiguous or controversial pain syndromes is considered unratable. If an individual appears to have pain-related impairment that has increased the burden or his or her condition *slightly*, the examiner may increase the percentage up to 3% whole person permanent impairment. If the examiner performs a formal pain-related impairment rating, he or she may increase the percentage by up to 3% and classify the individual's pain-related impairment into one of four categories: mild, moderate, moderately severe, or severe. This 3% range may not be used in conjunction with the 3% range provided for rating spinal impairment using the Diagnosis Related Estimates Method or when other discretionary impairment is given in this 3% range. This distinction is not clear in the *Guides*; therefore it is likely that this will result in confusion and litigation. It has been clarified by the authors in the *Guides Newsletter*[5] and in the text *Master the AMA Guides Fifth: A Medical and Legal Transition to the Guides to the Evaluation of Permanent Impairment, Fifth Edition.*[6]

In the Fifth Edition, the performance of a formal pain-related impairment rating is done if the individual appears to have pain related impairment that is substantially in excess of the conventional impairment rating, or the individual has a well-recognized medical condition that is characterized by pain the absence of measurable dysfunction, or there is a syndrome with the following characteristics "(a) it is associated with identifiable organ dysfunction that is ratable according to other chapters in the *Guides*; (b) it may be associated with a well-established pain syndrome, but the occurrence or nonoccurrence of the pain syndrome is not predictable; so that (c) the impairment ratings provided in step A do not capture the added burden of illness borne by the individual because of his or her associated pain syndrome" (5th ed., 573). A pain related impairment score is obtained from a point system derived from information obtained from the patient and the physician. Using Table 18-4, "Ratings Determining Impairment Associated With Pain" (5th ed., 576) the patient completes information about his/her pain, activity limitations or interference, and mood. Each section results in a score, totaling to a maximum of sixty. The physician assesses global pain behavior (whether it supports or questions pain complaints) and makes a clinical judgment on credibility, each of these two areas results in an adjustment of minus to plus ten. The resulting score, which is not an impairment rating, places the patient in a pain impairment class. It is probable that this process will require more examiner time and result in more challenges and therefore more litigation, however the amount of quantitative impairment is relatively small, e.g. 3% whole person permanent impairment. It is estimated that the rating of impairment per Chapter 18 will involve an additional fifteen to thirty minutes of examiner time.

A new discussion of behavioral confounders is presented in the Fifth Edition in Section 18.4 (5th ed., 581-583). Assessing behavioral reliability includes analysis of congruence with established conditions,

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[5] Robinson J, Turk DC, Loeser JD. Pain Evaluation: Fifth Edition Approaches. *Guides Newsletter*. January – February 2002.

[6] Cocchiarella L, Lord SJ. *Master the AMA Guides Fifth: A Medical and Legal Transition to the Guides to the Evaluation of Permanent Impairment, Fifth Edition.* AMA Press. Chicago. 2001.

consistency over time and situations, consistency with anatomy and physiology, observer agreement, and inappropriate illness behavior. Section 18.5 (5th ed., 583-584) summarizes the steps in performing a rating. The Fifth Edition chapter concludes with a discussion of psychogenic pain in Section 18.6 (5th ed., 585) and malingering in Section 18.7 (5th ed., 585-586)

AMA *Guides* Critique

The AMA *Guides to the Evaluation of Permanent Impairment* are the most widely used criteria for determining permanent impairment. The Fourth and Fifth Editions are more complex than the Third Edition, Revised, and, in general, will require more effort by rating physicians and result in lower ratings. The Fifth Edition, published in November 2000, appears to have more inconsistencies, dated methodology, contradictions, and errors than any of its prior editions.

As noted previously, some members of the Steering and Senior Advisory Committees for the Fifth Edition expressed their concerns about the *Guides* and offered recommendations that were published in the Journal of the American Medical Association on January 26, 2000.[7] Unfortunately none of the three editions meet these recommendations, which include:

The *Guides* Should Provide a System to Rate Permanent Impairments, Including Functional Limitations

Each of the editions base impairment largely upon peer consensus concerning the relative impairment for a specific finding, often based on anatomical or diagnostic findings, rather than functional loss.

Impairment Ratings Should Be Based on Scientific Evidence

Musculoskeletal impairments, the types of impairments most commonly encountered, are not based on scientific evidence, rather consensus of a selected group of "experts".

Impairment Ratings Should Be Based on a Valid Whole Person Impairment (WPI) Scale That Accurately Reflects Functional Loss

There are significant variances throughout the *Guides* in terms of relative functional loss, for example a patient with severe low back pain with an ongoing single level radiculopathy after surgery will be limited to 10% whole person permanent impairment with the Fourth Edition and the same limited range of 10-13% with the Fifth Edition. Yet, in the Fifth Edition a patient with a post-traumatic neuralgia of the superficial radial nerve secondary to injury receives 25% impairment of the whole person. (5th ed., Example 13-44, p. 344), a patient with recurrent bilateral inguinal hernias after unsuccessful herniorrhaphy receives 30% impairment of the whole person (5th ed., Example 6-31), and a patient with exertional angina pectoris secondary to coronary artery disease receives 30% to 35% impairment of the whole person (5th ed., Example 3-14, p. 39)

[7] 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; 283:519-523.

The Impairment Ratings Should Be Reliable

Impairments are often not reliable, for several reasons, including: physician judgment and bias, poor reliability of examination findings (e.g., range of motion, strength, and sensory assessment), unclear directions and complexities in the *Guides*, and inconsistencies among the chapters.

The *Guides* Should Be Comprehensive

The *Guides* do not provide a basis for rating all types of impairments encountered; in particular none of the Editions provide a basis for rating cumulative trauma and psychiatric impairment. None of the Editions of the *Guides* provide processes for rating commonly performed lower extremity surgical procedures.

The *Guides* Should Be Internally Consistent

There are significant inconsistencies among the Chapters, each written by a different committee. There are numerous examples, including in the Fifth Edition complex regional pain syndrome is rated by different approaches in Chapter 13, The Central and Peripheral Nervous Systems, Chapter 16, The Upper Extremities, and Chapter 18, Pain. Peripheral nerve sensory deficits are rated into different classes and using different definitions in Chapter 13, The Central and Peripheral Nervous Systems, and Chapter 16, The Upper Extremities. In Chapter 13, higher impairment is given for the dominant extremity, however in Chapter 16 there is no different between the two extremities. Strength loss is used in a "rare" case to rate impairment in Chapter 16, however it is not used in Chapter 13. In Chapter 15, The Spine, a single level surgical fusion often results in a higher rating than a multiple level surgical fusion. In Chapter 17, The Lower Extremities, atrophy is used for rating impairment, however this approach is not used in Chapter 13, The Central and Peripheral Nervous Systems, or in Chapter 16, The Upper Extremities.

The *Guides* Should Be Comprehensible

The *Guides* are challenging to use and often the directions are unclear. The Fifth Edition of the *Guides* is particularly daunting, due to its complexity and length (e.g. approximately two and half times the length of the Third Edition, Revised). There are significant inconsistencies within the Fifth Edition, and a number of errors were present in the Fifth Edition. These errors are reflected in an Errata published in March 2002 (http://www.ama-assn.org/catalog/guideserrata.pdf).

The System for Ratings Should Be Accessible

Since the *Guides* are complex and difficult to use, not all physicians are capable of rating impairment – it requires specific knowledge and skills.

The *Guides* Should Be Acceptable

Since the *Guides* do not provide a fair and reliable approach to assessing functional loss, many participants impacted by their ratings will find them not acceptable.

Despite these numerous shortcomings, at this time there is no other widely accepted basis to assess impairment, therefore the *AMA Guides to the Evaluation of Permanent Impairment* remain the standard. It is hoped that subsequent editions will improve the process of providing fair assessments of functional loss.

Recommendations

The Third Edition, Revised of the AMA *Guides to the Evaluation of Permanent Impairment* is an out-dated approach to assessing musculoskeletal impairment. From a workers' compensation perspective, the major advancements with the Fourth and Fifth Editions are the changes is assessing spinal and lower extremity impairment. The relative advantages and disadvantages of the Fourth and Fifth Editions are such that it is not possible to recommend one edition over another.

The Fourth Edition is more comprehensive than the Third Edition, Revised and introduced the Injury Model (Diagnosis-Related Estimate) approach to rating spinal impairment The Fifth Edition provides further detail than the Fourth Edition, however at the expense of greater complexity and more inconsistencies. The Fifth Edition is the most current and widely used Edition, however it represents many opportunities for improvement, as did the Third Edition, Revised and Fourth Editions. It is hoped that the Sixth Edition or alternative approaches to assessing impairment and functional loss will ultimately meet the true needs of workers' compensation jurisdictions. It is unlikely that alternatives will be available in the immediate future. At this time, however, the choices are limited to the Third Edition, Revised, Fourth and Fifth Editions.

The State of Colorado will need to assess both the relative advantages and disadvantages of these Editions and the overall impact of the change in Editions. The goals must be the assurance of a fair, reliable, practical and acceptable process for evaluating injured workers and rating permanent impairment.

The challenges involved in changing to a new Edition can be reduced by providing guidance and making modifications to the rating processes. These modifications are designed to reduce confusion, inconsistencies, and controversy.

Fourth Edition Recommendations

If the Fourth Edition is adopted, the following recommendations should be considered:

(1) Require a clear, accurate and complete report, as defined in Section 2.4 Preparing Reports (4th ed., 10-12), including, as a minimum, completion of the Report of Medical Evaluation (4th ed., 11-12).

(2) Enforce requirement for the completion of Figure 1. Upper Extremity Impairment Evaluation Record (4th ed., 16-17) for all upper extremity assessments.

(3) Exclude the use of Table 16. Upper Extremity Impairment Due to Entrapment Neuropathy (4th ed., 57).

(4) Exclude the use of impairment determined by pinch loss (due to problems of assessing interrater reliability) and limit the use of grip strength testing to a discrete muscular injury to the flexor musculature of the forearm.

(5) In terms of lower extremity impairment, permit the use of limb leg length discrepancy only if there was a fracture that caused the discrepancy and permit the use of muscle weakness ratings only when there is objective evidence of muscular dysfunction.

(6) In terms of spine impairment evaluations, require the use of the Injury or Diagnosis-related Estimates (DRE) Model unless there has been a surgical fusion and modify the Model as follows:

a. Impairment is to be based on the findings when at maximum medical improvement, either documented by the rating physician or consistently documented by other examiners since the date of MMI.

b. Provide a range of 3% for each category that is based on ratable findings, e.g. for the lumbar spine, DRE Category I remains 0%, DRE Category II 5 – 8%, DRE Category III 10 – 13%, DRE Category IV . . . The patient is to be placed in the range dependent on extent of interference in activities of daily living, as judged by the physician. In the event of question, the Range of Motion Method may be used to provide guidance, however the final rating is based on the DRE Model.

c. For the lumbar spine, change the definition of DRE Lumbosacral Category IV to include multilevel radiculopathy (bilateral or involves several levels)

(7) In terms of spine impairment evaluations, if there is a fusion, require the use of the Range of Motion Model.

(8) Rate objectively diagnosed complex regional pain syndrome using Section 4.3 The Spinal Cord, not Chapter 3, The Musculoskeletal System.

Fifth Edition Recommendations

If the Fifth Edition is adopted, the following recommendations should be considered:

(1) Require a clear, accurate and complete report, as defined in Section 2.6 Preparing Reports (5th ed., 21-22), including, as a minimum, completion of the Sample Report for Permanent Medical Impairment (5th ed., 23-24). (This should improve quality, for both treating physicians and evaluating physicians.)

(2) In terms of the spine, the Diagnosis-related Estimate (DRE) method is to be used as the primary method for an individual who has had a distinct injury, and Section 15.2 Determining the Appropriate Method for Assessment, could be modified as follows in terms of when the Range of Motion (ROM) method is to be used:

a. On page 380, in terms of # 2, reword to state "When there is multilevel involvement in the same spinal region (e.g., fractures at multiple levels, disc herniations with radiculopathy, or stenosis with radiculopathy at multiple levels or bilaterally" (This clarifies the ROM model is not to be used simply for multiple disc herniations, therefore will reduce confusion and litigation)

b. On page 380, in terms of #3, remove "at multiple levels". (This will permit the Range of Motion Method to be used for rating all surgical fusions, thereby decreasing the discrepancy between single and multiple level fusions.)

c. On page 380, in terms of #4, insert a comma after "recurrent radiculopathy" so this will read, "When there is recurrent radiculopathy, caused by a new (recurrent) disk herniation of a recurrent injury in the same spinal region." (This will reduce the confusion and controversy over use of the ROM method for any recurrent injury.)

(3) In rating the spine using the Diagnosis-Related Estimates method, impairment is based on the condition once MMI is reached and based on findings either at the time of the rating examination or reproducible findings by other reliable examiners since the examinee has been at MMI.

(4) Enforce the requirement for the completion of Figure 16-1a. Upper Extremity Impairment Evaluation Record (5th ed., 436-437) for all upper extremity assessments.

(5) Exclude the use of impairment determined by pinch loss (due to problems of assessing interrater reliability) and limit the use of grip strength testing to a discrete muscular injury to the flexor musculature of the forearm.

(6) Rate objectively diagnosed complex regional pain syndrome using Section 13.8 Criteria for Rating Impairments Related to Chronic Pain, not Chapter 16, The Upper Extremities.

(7) Standardize the rating of peripheral nerve sensory and motor loss to one approach, either Chapter 13, The Central and Peripheral Nervous Systems or Chapter 16, The Upper Extremities.

(8) Enforce the requirement for the completion of Figure 17-10, Lower Extremity Impairment Evaluation Record and Worksheet (5th ed., 561) for all lower extremity assessments.

(9) In terms of lower extremity impairment, permit the use of limb leg length discrepancy only if there was a fracture that caused the discrepancy and permit the use of muscle weakness ratings only when there is objective evidence of muscular dysfunction.

(10) Do not provide quantitative ratings of impairment for pain from Chapter 18.

Evaluator Impact

Although the vast majority of the Third Edition, Revised Ratings resulted in the same ratings as those obtained by the reviewer, there are opportunities for improvement.

The *Guides* provide a defined approach to assessing impairment and offer in Chapters 1 and 2 overall directives. It is necessary for examiners to be thorough in documenting their clinical findings and rating process. Histories should be presented in adequate detail, with particular focus on the patient's current status and his or her activities of daily living. The history obtained from the patient should be

differentiated from that obtained via a medical record review, and this information should be presented in a clear, organized format. Physical examination findings must provide all the data needed to assess the patient clinically and to determine permanent impairment. With the Fourth and Fifth Editions additional data must be obtained, particularly for lower extremity and spine impairment evaluations, and with the Fifth Edition for upper extremity impairment evaluations. This will require additional examiner time.

A clear, accurate and complete report should be prepared, regardless of which Edition is used. The three steps in the Third Edition, Revised (Section 2.3) and the Fourth Edition (Section 2.4) were: medical evaluation, analysis of findings, and comparison of the analysis results with the impairment criteria. In the Fifth Edition, Section 2.6 Preparing Reports is divided into three steps—clinical evaluation, calculation of impairment, and discussion of how the impairment rating was calculated. Physicians need to be aware of these standards, and reflect this in their reports. Since rating processes require, in general, more discernment in the Fourth and Fifth Editions, physicians need to understand how specific rating criteria are applied.

It is difficult to define precisely the amount of time that will be required to assess impairment with the Fourth and Fifth Editions. First, none of the reports reviewed documented how much time was involved in examining the patient, performing the evaluation and preparing the report. Second, the amount of time varies widely based on the type of problem(s) and the thoroughness of the evaluator. Overall, the performance of a quality impairment evaluation of the upper extremity should require approximately the same time with each of the Editions, assuming that examiners current are recording measurements of the opposite extremity, if they are not it will take approximately five to ten minutes longer. Lower extremity evaluations performed using the Fourth and Fifth Editions will require somewhat more time, approximately twenty five percent greater time. Spinal impairment evaluations are simpler with the Fourth Edition, and therefore will generally require somewhat less time. Spine impairment evaluations with the Fifth Edition will require approximately the same time. If pain is evaluated with the Fifth Edition, the examinee will need to complete the Pain Inventories provided in the *Guides* and the examiner will need to assess this information.

Appendix

Appendix: Data Elements

The following data elements were provided for each of the two hundred and fifty cases provided, except in those cases where the data provided was unavailable.

- Workers' Compensation #
- Date of Injury
- MMI Date – the date on the last Final Admission filed with the Division in the workers' compensation file
- Psychiatric rating indicator "Indicate a "Y" if the treating physician included psychiatric rating on the Final Admission, and an "N" if not
- Psychiatric rating given by original rating physician if included as a part of a whole person rating with a physical rating.
- Identify all Body part(s), including labeling right and left if applicable, being rated and included in the impairment rating. Body parts include hip, knee, ankle, foot, toe, shoulder, elbow, wrist, hand, fingers, cervical spine, thoracic spine, lumbar spine, and others as needed.
- Pre-apportioned impairment ratings for each case should be reported at each level in the AMA Guides for the following (i.e. at digits, hand, foot, upper and lower extremity, whole person etc,):
    1. Reporting physician 3rd revised ratings
    2. Reviewing physician 3rd revised ratings
    3. 4th edition rating
    4. 5th edition rating
- Percentage difference between 3rd revised edition and 4th and 3rd revised edition and the 5th editions of the AMA Guides at each level.
- Difference between the reporting physician's reported rating and the reviewing physician's 3rd revised edition rating at the most distal level that incorporates all the body parts. (e.g. digits if only a finger injury)
- Chronic Pain indicator – Indicate a "Y" if Chronic Pain would be appropriately rated under the 5th edition of the AMA Guides or an "N" if it is not appropriate to rate this case for chronic pain under the 5th edition or an "I" if the information supplied in the reporting physician's report was incomplete to determine a chronic pain impairment rating. Do not calculate a pain rating, nor include in the total.
- Provide a numerical quality score for each reporting physician's impairment rating report that was reviewed in this study.
- Apportionment Indicator – When the Division indicates that apportionment is not applicable to the case specify an "I". When the Division indicates apportionment is applicable in a case specify a "Y" if the rating was apportioned correctly by the reporting physician or an "N" if the rating was incorrectly apportioned or failed to be apportioned by the reporting physician.
- When the Division indicates that apportionment is applicable provide the rating after apportionment by the reporting physician. Report at each level as specified in number seven (7) of this list of data elements.

- When the Division indicates that apportionment is applicable provide the rating after apportionment by the reviewing physician. Report at each level as specified in number seven (7) of this of data elements.
- Report the body part of any amputation or total loss of use of an extremity including designate whether it is left or right.

Appendix: Quality of Evaluations

Ninety two percent of the Third Edition, Revised Ratings was correct, however there were opportunities for improvement with most reports, as discussed further in the Appendix of this report. The most common problem was applying the appropriate *Guides* criteria to the clinical data presented. This occurred in 63% of the erroneous cases. There were seven occurrences of a duplicative rating, e.g. the same problem was rated twice using different approaches resulting in an artificially elevated rating. A scale of 1 ("A") excellent to 5 ("F") unacceptable was used to rate the quality of the reports, with 3 ("C") reflecting a report that met basic standards. Reports performed by a Division of Workers Compensation Independent Medical Examiner (DIME) were of higher overall quality (2.14) ("B-"), than a none DIME examiner (2.76) ("C+") Five percent of the DIME and non DIME reports were overall of a 4 ("D") quality and one non-DIME report was overall a 5 ("F").

Neurologists, followed by family practitioners, occupational medicine physicians, and physical medicine and rehabilitation physicians, and orthopedic surgeons, performed the highest quality reports. Neurosurgeons and hand surgeons performed the lowest quality reports. It appears that those specialties that are more focused on problem solving, rather than technical, procedural skills, performed a more thorough evaluation and prepared a higher quality report.

Table 24 Quality of Reports by Specialty Type

Specialty	Score	Cases
Neurology	2.2	17
Family Practice	2.3	8
Occupational Medicine	2.4	53
Physical Medicine	2.5	72
Orthopedic Surgery	2.8	32
Not Specified	3.0	59
Neurosurgery	3.0	3
Hand Surgery	3.5	6

Reports lacked a consistent structure, therefore often lacked needed historical, physical examination, or radiographic data. The length of the reports varied from a single paragraph (occurring typically performed by a treating physician) to multiple pages (occurring typically within the context of a complex, whole person permanent impairment rating.) Several reports were combined with a functional capacity evaluation. The level of organization varied widely, from some reports highly organized to others being a single continuous paragraph over multiple pages. Most reports did not indicate what history was derived from the patient / examinee, the medical records, and/or personal knowledge of the patient. Examination data presented was often limited to that required for the rating. For example in a spinal rating, the exam may only report range of motion measurements, as opposed to a comprehensive spinal and neurological

assessment. Problem lists were rarely presented and clinical discussions were usually brief. Reports often did not discuss the use of specific rating criteria, a mandate defined in the AMA *Guides*. In general, DIME reports were more complete in all of these areas.

In many of the lumbar spine cases, range of motion measurements were obtained by a physical therapist, without verification by the physician. There were also times when the straight leg raising reported by the therapist appeared questionable, for example in one case a physical therapist states straight leg raising of 20 degrees on left and 10 degrees on right; however physician the stated "negative straight leg raising test bilaterally". If the true straight leg raising was greater than the numeric value reported by the physical therapist, it is probable that the 11% impairment for flexion would have been excluded. Many of the physical examinations of the spine were limited to reports of range of motion, e.g. more detailed observatory and palpatory findings were not reported, nor was a detailed neurological examination. The problems with reliability of inclinometry measurements is widely recognized, and it is probable that this is a significant issue with many of the evaluations. When a neurological examination was reported it was often superficial, for example, rarely reporting quantitative findings such as measurement of limb circumferences, which are not required in the third revised edition.

Few upper extremity impairment cases reported findings of the opposite extremity, a requirement with the Fifth Edition.

Appendix: State Specific Use of The AMA Guides

State	Edition most commonly used	Statute / Code	Comment
Alabama	4th	AL § 480-5-5-.35 Impairment Rating Guide	Specified by regulatory code, not anticipating use of 5th at this time. Alabama Administrative Code states that the "fourth edition should be the recommended guide".
Alaska	5th	AK S. §. 23.30.190(d)	Statutes state new edition to be adopted by board within 90 days of the last day of the month when the new edition is published
Arizona	5th	AZ Rev. S. Ann. § 23-1044; § 23-1065; Rule R20-5-113 (B) of the Workers' Compensation Practice and Procedure	Edition not specified by statute. *Guides* are used to support medical opinion and in supplementing Arizona's statutory disability schedule.
Arkansas	4th	Commission Rule 34	Guides used for non-scheduled injuries, excluding the use of ROM model for spine and rating of pain. Use of 5th anticipated later this year
California	State specific	Labor Code § 4660	Schedule for Rating Permanent Disability, an impairment-based rating system which additionally compensates for pain and loss of work capacity is mandated by statute and incorporated into administrative law. Not anticipating use of Guides
Colorado	3rd revised	Colo. Rev. Stat. § 8-42-101, § 8-2-101	4th or 5th may be used in the future
Connecticut	5th	Ct. § 31-308	May be used for medical evidence of partial impairment. Most recent edition specified
Delaware	4th	Not specified	Guides used as evidence on cases of nonscheduled disabilities, however use not mandated. May make use of the 5th in the future
Florida	State specific	FS § 440.13(4)(a), § 440.15 (3)(a) 3, § 550.15	State specific guide, however incorporated some principles from the Fourth. Not anticipating use of AMA *Guides*
Georgia	5th	GA Code Ann. § 34-9-263(d)	5th adopted as of July 1, 2001
Hawaii	5th	Regulations DLIR § 12-10-21(a); HI Rev. Stat. §386-32	5th adopted this year, also use a schedule and rules for rating nonscheduled disability
Idaho	5th		Fifth edition used as medical evidence, neither regulation nor state require it
Illinois	State specific	820 ILCS § 305/1	State schedule used for certain cases, no reference in statutes or regulations to the *Guides*

Indiana	4th and 5th	IN Code 22-3-3-10	*Guides* used not required, however latest edition of *Guides* often used to evaluate nonscheduled impairment
Iowa	5th	IA Adm. Code, Reg §876-2.4; Code §§ 85.34(2) "a" to "s"	Not required, however may be used
Kansas	4th	K.S.A. § 44-510d,e	Not known if 5th will be used in the future.
Kentucky	5th	KY Rev. Stat. Ann. § 342.0011; 803 KY A.R. 25 :010 § 1(9)	Specifies latest available edition, 5th ed. as of 3/1/01
Louisiana	2nd	LA Rev. Stat. Ann. § 23:1121	*Guides* "copyright 1984 by the American Medical Association" specified for rating nonscheduled and some partial losses of scheduled impairments
Maine	4th	ME Title 39-A, 153 § 8	4th specified, use of 5th under consideration
Maryland	4th	MD Ann. Code: LE § 9-721, and Rules of Procedure Reg 14.09.04.01 & .02	Code specifies that the examiner must take into account pain, weakness, atrophy, and loss of endurance and loss of function. *Guides* not mentioned, however are admitted as evidence
Massachusetts	5th	MA Gen. Law ch. 152, § 35	Edition not specified. Incorporates *Guides* by statute, requiring its use when statutory schedules for amputations do not provide a disability rating
Michigan	*		Not specified. Scheduled amputations and total permanent disabilities are listed in law.
Minnesota	State specific		State specific schedule of permanent partial disabilities used.
Mississippi	*		Traditional amputation schedule used. Fourth edition used for hernias.
Missouri	*		No guide for nonscheduled injuries, but ratings from *Guides* may be used
Montana	5th	MT Code Ann. § 39-71-703, 39-71-711(b)	Current edition specified
Nebraska	*	NS Stat. § 48-121	Guide not specified, however commonly used as a predicate for disability
Nevada	4th	NV Rev. Stat. § 617.459; NV Ann. Code 616C.002	Fourth Edition adopted by administrative regulation, not known when fifth will be adopted
New Hampshire	5th	NH Rev. Stat. Ann. § 281-A: 32; Labor rules 508.01(d)	Most recent edition specified
New Jersey	*	NJ Stat. Ann.. § 34:15-12	*Guides* not formally used. Judge determines nonscheduled losses on basis of medical evidence
New Mexico	5th	NM Stat. Ann. § 52-1-24	Most recent edition specified. Impairment modified by other factors to determine disability.
New York	State specific		Uses own guide, not anticipating use of Guides
North	State	NC Stat. 97, WCA	Use on guides presented in the NC Workers

Carolina	specific	97-31	Compensation Manual
North Dakota	5th	ND Cent Code § 65-01-02	Most current edition specified. Fifth edition adopted 7/31/01
Ohio	4th	OH Rev. Code § 4123.57	Statute specified, most recent, but per Ohio Bureau "interpretive guideline" 4th in use at this time. Anticipate use of 5th within the year
Oklahoma	5th	OK Stat. Title 85, § 3	Latest Publication. Prohibits use of DRE method
Oregon	3rd	OR Adm. Rule 436-035-0007; Bull. 239, Rev. 7/15/98	Uses own guide, based on the Third Edition. Reported that the use of 5th is anticipated.
Pennsylvania	5th	PA Stat. Ann. Tit. 77, § 511.2	Most recent edition specified, and effective for all ratings on and after August 1, 2001
Rhode Island	5th	RI Gen. Laws § 28-29-2	Most recent edition specified
South Carolina	*	SC Reg. Sec. 67-1101	Not specified, however 4th and 5th have been used
South Dakota	4th	SD Codified Law 62-1-1.2	Fourth Edition required by statute. Not know when and if 5th ed. will be used
Tennessee	5th	TN Code Ann. § 50-6-204	Most recent edition specified
Texas	4th	TX Lab. Code Ann. § 408.124; WCC Rule 130.1	As of 10/15/01, 4th ed. required; Third Edition Revised, 2nd printing prior to that date
Utah	State specific	Rule 612-7-3	State specific guidelines, with consideration to most recent edition of Guides
Vermont	5th	VT Stat. Ann. Tit. 21, § 648	Most recent edition; 5th ed. as 4/1/01.
Virginia	*	VI § 65.2-503	Guides most often used as source of impairment rating. No specific guide mentioned in statute or regulation.
Washington	5th; State	WA Rev. Code 51.32.080; WAC 296-20-220(e)	State specific guidelines for spine, 5th ed used for other Musculoskeletal and other system impairments
West Virginia	4th	85 WV Code Stat. Reg. § 16-4	Fourth edition adopted by regulations. Not known when 5th ed. would be used. Spine impairment must be rated using ROM.
Wisconsin	State specific	WI Adm. Code 80.32, 80.33; WI Stat. § 102.44	Not anticipating use of Guides. State specific schedules provided for rating.
Wyoming	5th	WY Stat § 27-14-405(g)	Most recent edition specified

Appendix: Comparison with Other Studies

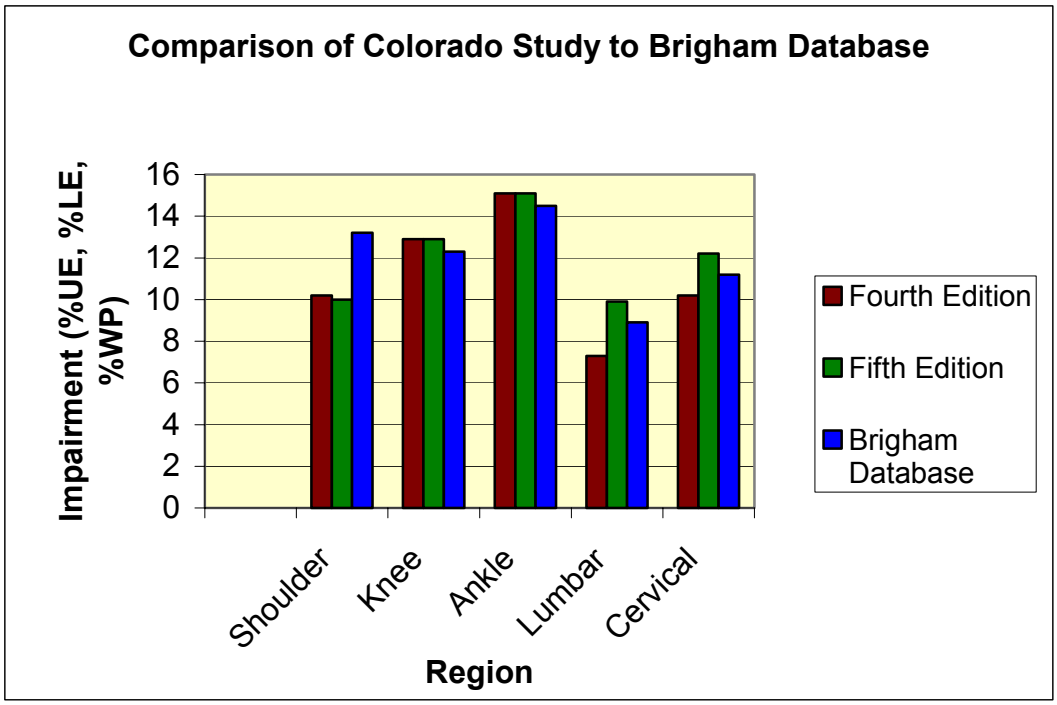
There are no published studies that compare impairment ratings among the three editions revised. The reviewer does track data concerning impairment evaluations he has performed or reviewed on a national basis. This data is not differentiated in terms of which ratings were performed using the Fourth and the Fifth Editions.

The results between the Colorado Study and the Brigham Database were similar.

Table 25 Comparison of Colorado Study to Brigham Database

Region	Colorado Study Average Rating – 4th ed.	Colorado Study Average Rating - 5th ed.	Brigham Database Average Rating (mixed 4th and 5th)	Brigham Database Number of Cases
Upper Extremity – Shoulder	10.2% UEI	10.0% UEI	13.2% UEI	38
Lower Extremity – Knee	12.9% LEI	12.9% LEI	12.3% LEI	39
Lower Extremity – Ankle	15.1% LEI	15.1% LEI	14.5% LEI	23
Spine – Lumbar	7.3% WPI	9.9% WPI	8.9% WPI	123
Spine - Cervical	10.2% WPI	12.2% WPI	11.2% WPI	52

Figure 14 Comparison of Colorado Study to Brigham Database



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Appendix: Curriculum Vitae – Christopher R. Brigham, MD

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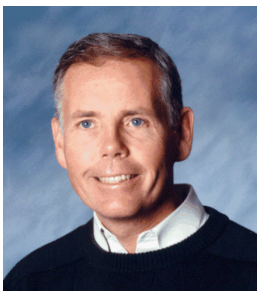
SUMMARY



- Strong clinical and academic credentials, including board certification in occupational medicine, certification as an independent medical examiner (Founding Director of ABIME) and forensic examiner, and fellowship status in occupational medicine (FACOEM) and disability evaluation (FAADEP).
- Internationally recognized expert in impairment and disability assessment, use of the AMA *Guides to the Evaluation of Permanent Impairment* and independent medical evaluations, in the arenas of workers' compensation, personal injury and long-term disability.
- Experienced consultant who has assisted diverse clients.
- Director, Division of Occupational Health at the Maine Medical Center; Attending Staff, Department of Medicine.
- Distinguished speaker and trainer who has developed and implemented throughout the United States, Canada and Australia many successful seminars and conferences focusing on workers' compensation, impairment and disability issues.
- Respected author, editor and producer of educational media, including several texts, newsletters, computer-based resources, videotape and audiotape programs; Editor-in-Chief, AMA *Guides Newsletter*; Chair, Professional Advisory Board, *Medical Disability Advisor* – Fourth Edition

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PROFESSIONAL EXPERIENCE

Brigham and Associates, Inc., President — Portland, ME, 1994 – current

Consultant, author and trainer on impairment evaluation and disability assessment, medical aspects of workers' compensation and disability management, and occupational medicine. Medical practice includes impairment evaluation reviews, medical file reviews, impairment and independent medical evaluations, consulting and clinical services.

SEAK, Inc., Executive Vice-President Falmouth, MA, 1990 - 1999

SEAK, Inc. - Legal and Medical Information Systems is a leading national provider of educational resources for physicians, attorneys and other professionals. Responsibilities include design, development, and implementation of educational media (publications, newsletters, audio and video programs), seminars, and conferences on issues of workers' compensation, occupational medicine, and the medical-legal interface.

Occupational Health Resources, Inc., Vice President, Medical Affairs Philadelphia, PA, 1993 - 1994

Responsibilities included product and professional staff development, physician recruitment, quality improvement, independent medical evaluation services, and professional relations (OHX was acquired by OHR in 1993)

Occupational Health Excellence, Inc., President and Founder Falmouth, ME, 1988 - 1994

Responsibilities included organizational leadership, consulting on disability assessment and management, research, training, and product development.

Occupational Health Excellence of Maine, Senior Consultant Falmouth, ME, 1992 - 1997

Developed an occupational medicine group practice. Services currently provided on a contractual basis.

Health Management Systems, Inc., Medical Director Boston, MA, 1986 - 1988

Independent medical evaluation network with over five hundred physicians in New England.

Envirologic Data, Occupational Health Consultant Portland, ME, 1986 - 1988

Consultation on health, toxicology and environmental risk analysis.

St. Joseph Ambulatory Care, Inc, Medical Director Bangor, ME, 1985 - 1986

Hospital-based occupational medicine program.

Marine Health Services, Inc., President Bar Harbor, ME, 1980 - 1986

Consultation and education on health problems in small boat building and marine industries.

Emergency and Safety Programs, Inc., Consultant Medical Director Media, PA, 1983 - 1986

Safety training, with emphasis on medical care in isolated environments.

Medical Associates of Bar Harbor, Family Physician and Partner Bar Harbor, ME, 1979- 1985

Multi-specialty group practice. Emphasis on occupational medicine, emergency medicine, and primary care.

Washington University Biomedical Computer Laboratory, Consultant St. Louis, MO, 1975-1976

Developed Quest computer-based learning system for microcomputers.

Massachusetts General Hospital, Computer Sciences, Consultant Boston, MA, 1972

Developed computer-based learning systems in MUMPS.

Rutgers Medical School, Community Medicine, Teaching Assistant Piscataway, NJ, 1970 – 1974

Computer consultant and teaching assistant in biomedical statistics.

Dow Jones and Company, Systems Programmer Princeton, NJ, 1966 –1970

Developed computer communications systems for multi-site operations.

CONSULTING PROJECTS (SELECTED)

Occupational Health and Disability Management Consultant to industry, research institutions, health care organizations, insurers (workers' compensation, long term disability, and personal injury), legal firms (defense and plaintiff), workers' compensation boards (United States, Canada and Australia), governmental agencies, trade organizations, labor organizations, physician practices, and other entities, for over twenty years, 1980 - current. Consulting activities including comprehensive occupational health consulting, workers' compensation management, disability evaluation and management, and training.

Clients have included Xerox, General Motors Corporation, Ford Motor Company, Citgo, Mobil Corporation, James River Corporation, Union Pacific Railroad, L. L. Bean, CNA, Disability Consulting Group, Duncanson and Holt, State of Nevada, State of Wyoming, State of Washington, American Board of Independent Medical Examiners, Maui Occupational Health Center, Alexander and Alexander Consulting Group - AlexComp Consulting Plus, AON Consulting, Pennsylvania AFL-CIO, American Boat Builders and Repairers Association, Lister Hill National Center for Biomedical Communications (National Library of Medicine), and numerous other organizations.

EDUCATION

Eastern Maine Medical Center, Bangor, Maine, June 1976 - June 1979
Family Practice Residency

University of Southern Maine, Portland, Maine, June 1997
Certification in Human Resources Management

Washington University School of Medicine, St. Louis, MO, July 1974 - June 1976
M.D.

Rutgers Medical School, Piscataway, NJ, September 1972 - May 1974
M.M.S. (Masters of Medical Science)

Rutgers College, New Brunswick, NJ, September 1968 - June 1972
B.A. in Biological Sciences

CERTIFICATIONS

Board Certified, American Board of Preventive Medicine, with specialization in Occupational Medicine, certificate 22110, 1986

Fellow, American College of Occupational and Environmental Medicine, 1989 - current

Fellow, American Academy of Disability Evaluation Physicians, 1992 - current

Certified Independent Medical Examiner, American Board of Independent Medical Examiners, Certificate 95-0001,

1995

Board Certified Forensic Examiner and Diplomat American College of Forensic Examiners, certificate 8567, 1996

Diplomat American Board of Forensic Medicine, 1998

Board Certified, American Board of Family Practice, 1979 - 2000

State of Maine Board of Registration of Medicine, Permanent License, Certificate #9405, 1977 - current

State of Hawaii Board of Registration of Medicine, Permanent License, Certificate # 11334, 2001 - current

Diplomat, National Board of Medical Examiners, Certificate #167363, 1977 – current

ACADEMIC POSITIONS/ HONORS

Director, Division of Occupational Health, Departments of Medicine and Family Practice, Maine Medical Center, Portland, ME, 1987 - current.

Clinical Instructor, University of Vermont School of Medicine, 1991 - present
Editorial Board Member, *Journal of Occupational Rehabilitation*, 1990 - 1995.

Member, National Advisory Committee on Industrial Rehabilitation, Commission on Accreditation of Rehabilitation Facilities, 1994 - 1996.

Editor, *Effective Medical Witness*, 1996 – 1998.

Editor-in-Chief, AMA *Guides Newsletter,* American Medical Association, 1996 - current.

Member, Senior Advisory Committee, and Reviewer, *AMA Guides to the Evaluation of Permanent Impairment,* Fifth Edition, American Medical Association

Cited in *Who's Who in Medicine and Healthcare*, 1997-1998, 1998-1999, 1999-2000

Cited in *Who's Who in the World, 15th Edition,* 1998, *16th Edition* 1999, *17th Edition* 2000

Citations to in 2000 editions of *Who's Who in the World (Millennium Issue), Who's Who in America, Who's Who in Medicine and Healthcare (Millennium Issue)* and *Who's Who in Science and Engineering.*

MEDICAL STAFF MEMBERSHIPS

Maine Medical Center, Portland, ME, Attending Staff, Department of Medicine. 2001 – current; consulting staff with *active clinical and admitting privileges.* 1986 - current. Director, Division of Occupational Health, 1986 – current.

Mount Desert Island Hospital, Bar Harbor, ME, active staff, 1979 - 1985; consulting staff 1985 -current; President of Medical Staff and Member Board of Trustees, 1983 - 1984; Vice-President of Medical Staff, 1982 - 1983; Secretary of Medical Staff, 1980 - 1982; Director of Medical Education, 1980 - 1984.

PROFESSIONAL AFFILIATIONS

American College of Occupational and Environmental Medicine, 1984 - current.
Member, Board of Directors, 1996 – 1999.
Section on Computers in Occupational Medicine, Vice-Chairperson, 1986 - 1987, 1986 – 1997.
Committee on Occupational Mental Health, Chairperson, 1988 - 1992, 1988 - 1994.
Council on Social Issues, Member, 1988 - 1992.
Section on Work Fitness and Disability Evaluation, Secretary, 1991 - 1993, 1991 - current.
Section on Private Practice, 1991 - current. Advisory Board, 1994 - 1996.
Committee on Conferences, 1995 - current. General Conference Chairperson, Orlando, 1997.

American Academy of Disability Evaluating Physicians, 1990 - current.

American Board of Independent Medical Examiners, 1994 - current. Founding Director and Senior Consultant. Director, 1994 – 2001. Chair, Advisory Board, 2001.

American College of Forensic Examiners, 1996 - current.

Maine Safety Council, Director, 1985 - 1988.

New England Occupational Medical Association, 1984 - current. Director, 1988 - 1990.

National Association of Disability Evaluating Professionals, 1996 - current.

National Association of Occupational Health Professionals, 1994 - current.

PUBLICATIONS (SELECTED)

with Kamp M. Computer-assisted instruction in the health sciences (guest editors). *Computer Bio Med*, special issue 3 (3): 181-351, October 1973.

with Kamp M. The current status of computer-assisted instruction in the health sciences. *J Med Educ* 49 (3): 278-0, March 1974.

with Landrigan PL. Health hazards in boat building (guest editors). *Am J Ind Med* (special issue), 8, 1985.

with Harris J. Work-related low back pain: impact, causes, work relatedness, diagnosis and therapy. *OEM Report*, 4(11): 84-88, 1990.

with Harris J. Low back pain: Part II, administrative, disability and workers' compensation issues. *OEM Report*, 4(12): 92-96, 1990.

Medical analysis of workers' compensation claims. *Workers' Compensation Monthly*, 11(5):1,188-23, 1991.

Independent medical evaluations. *Visions*, July/August 1991.

Independent medical evaluations and disability assessment. *OEM Report*, 6(1):5-7, 1992.

Performing independent medical evaluations. Chapter 14 in *Occupational Health Services: Practical Strategies for Improving Quality and Controlling Costs*, American Hospital Association, 1993.

with Engelberg A. Independent medical evaluations. Chapter 7 in *A Practical Approach to Occupational and Environmental Medicine*, Little, Brown & Co, Boston, MA. 1994.

with Moon S and Sydnor M. Cumulative Trauma Disorders: Impairment and Disability Assessment.

with Babitsky S, Mangraviti J. *The Independent Medical Evaluation Report: A Practical Approach*, SEAK, Inc., 1996.

Impairment and Disability: Using the *Guides. Guides Newsletter*, September 1996.

Key Principles in Using the *Guides*. *Guides Newsletter,* Part I January 1997, Part II March 1997.

Using the *Guides* for Permanent Partial Disability Determinations. *Guides Newsletter,* March 1997.

with Talmage J. Rating Pain After a Musculoskeletal Injury. *Guides Newsletter,* July 1997.

The Comprehensive IME System: Essential Resources for an Efficient and Successful IME Practice, SEAK, Inc., Falmouth, MA, 1998.

with May VR, Taylor D, Washington C. Functional capacity evaluation, impairment rating, and applied certification processes. *NeuroRehabilitation*, 11:13-27, 1998.

with Babitsky S. Independent Medical Evaluations and Impairment Ratings. *Occupational Medicine Start of the Art Reviews*, 13(2): 325 - 345, April - June 1998.

Disability Management - Chapter 8 in *Integrated Health Management*, OEM Press, 1998.

Performing Quality Impairment Evaluations. *Guides Newsletter,* July – August 1998.

Measurement of Shoulder Joint Motion. *Guides Newsletter*, September - October 1998.

AMA *Guides* Red Flags. Workers' Compensation Monthly, 18(12):1, 19, December 1998.

Evaluating Pain. *Guides Newsletter,* July – August 1999.

The Guides Casebook. American Medical Association, Chicago, 1999.

with Mandel S. Impairment of Neurogenic Bladder Dysfunction. *Guides Newsletter*, January – February 2000.

Understanding the AMA *Guides*. *J Workers' Compensation,* 9(2): 9 – 29, 2000.

with Ensalada L. Somatization. *Guides Newsletter*, July – August 2000.

Non-organic Findings. *Guides Newsletter*, July – August 2000.

Perfecting the IME Process. *Guides Newsletter,* September – October 2000.

with Talmage JB, Ensalada LH. Fifth Edition: The New Standard. *Guides Newsletter,* November – December 2000.

with Martin JT, Brooks CN. Evaluation of Low Back Pain. *Guides Newsletter*, January – February 2001.

Spinal Impairment Evaluation: Comparison of the Third Edition Revised, Fourth and Fifth Editions. *Guides Newsletter*, January – February 2001.

Websites of Interest. *Guides Newsletter*, March – April 2001.

with Brooks CN, Upper Extremity Impairment Evaluation: Fifth Edition Revisions, *Guides Newsletter*, May - June 2001.

Lower Extremity Impairment Evaluation: Fifth Edition Revisions, *Guides Newsletter*, July - August 2001.

with Leclair N. Fibromyalgia Syndrome: Impairment and Disability Issues, *Guides Newsletter*, July - August 2001.

Chair, Medical Advisory Board; Reed P. *The Medical Disability Advisor* Reed Group Ltd., 2001.

with Hirsch IH, Mandel S. Sexual Dysfunction Impairment. *Guides Newsletter*, September – October 2001.

Impairment Evaluations Standards: A Checklist. *Guides Newsletter*, September – October 2001.

with Leclair N. Fibromyalgia: A Monograph. *Disability Consulting Group Research Institute,* October 2001.

with Haralson R. Objectifying the Spinal Impairment Evaluation. *Guides Newsletter*, November – December 2001.

State Specific Use of the *Guides*. *Guides Newsletter*, November – December 2001.

with Ensalada LH. Chronic Fatigue Syndrome. *Guides Newsletter*, January – February 2002.

with Mueller K. Chapter 11 – Ear, Nose and Throat. *Guides Newsletter*, January – February 2002.

with Ensalada LH, Talmage JB. (eds) *The Guides Casebook – Fifth Edition*. American Medical Association, Chicago, 2002.

with Ensalada LH, Talmage JB. (eds.) Impairment and Disability Evaluation. – Special Issue: *Clinics in Occupational and Environmental Medicine,* in press for 2002.

with Boucher W. Impairment Evaluation: AMA Guides to the Evaluation of Permanent Impairment. Special Issue: *Clinics in Occupational and Environmental Medicine,* in press for 2002.

with Mueller K. Impairment Evaluation: The Other Chapters. Special Issue: *Clinics in Occupational and Environmental Medicine,* in press for February 2002.

with Boucher W, Engelberg A. Independent medical evaluations. in *A Practical Approach to Occupational and Environmental Medicine*, Little, Brown & Co, Boston, MA. 2002.

with Babitsky S, Mangraviti S, Todd C. Understanding the AMA Guides in Workers Compensation, Aspen Publications, New York, NY, 2002.

PRESENTATIONS (SELECTED)

(Note: This listing does not include hundreds of presentations to small group audiences.)

Medical Response Systems for Isolated Environments (with F. Poliafico). International Conference Oceans Safety and Health (ICOSH -85), Sydney, Cape Breton, NS, June 19, 1985.

Microcomputers in Occupational Medicine. American Occupational Health Conference, April 25, 1988.

Occupational Asthma: The Recognition and Management of Occupational Disease. Grand Rounds presentation at several medical centers in Maine, 1988.
Occupational Health: The Boat Building Industry. Maine Medical Center Grand Rounds, August 3, 1988.

Injury, Healing and Health Care. American College of Occupational Medicine, Boston, MA, May 5, 1989.

Evaluation of Toxicology Claims. Portland, ME, October 13, 1989.

Solvent and Lead Toxicity. Presentation at several county medical societies and regional medical centers in Maine, 1990.

Networks for Workers' Compensation Management. Forum II, International Association of Industrial Accident Boards and Workers' Compensation Commissions, February 1990.
Medical Analysis of Workers' Compensation Claims. Tenth Annual Workers' Compensation Conference, Hyannis, MA, July 1990.

Preventive Occupational Medicine - Management of Workers' Compensation. Tenth Annual Workers' Compensation Conference, Hyannis, MA, July 1990.

Workers Compensation: The Steps to Cost Containment. Ergonomic Decisions in the Workplace Conference, Portland, ME, June 20, 1991.

Eleventh Annual Workers Compensation and Occupational Medicine Conference (medical director). Hyannis, MA, July 21 - 23, 1992.

Low Back Pain: Cause, Work-Relatedness, Diagnosis and Treatment. Eleventh Annual Workers Compensation and Occupational Medicine Conference, Hyannis, MA, July 18, 1991.

Trial Demonstration: The Use of the AMA *Guides to the Evaluation of Permanent Impairment* in a Workers' Compensation Case (with S. Babitsky). Eleventh Annual Workers Compensation and Occupational Medicine Conference, Hyannis, MA, July 18, 1991.

Performance of Independent Medical Evaluations. Fall Meeting of Section on Work Fitness and Disability Evaluation, American College of Occupational Medicine, November 1, 1991.

Evaluation of Work-related Disability. Healthcare Management Conference, Workers' Compensation Board of Manitoba, Winnipeg, Manitoba, November 19 - 20, 1991.

Mini-Symposium on the Disability Exam: The "Ideal" Disability Exam. Clinical, Administrative and Regulatory Issues in Occupational Health, New England Occupational Medical Association, Boston, MA, December 5, 1991.

Medical Aspects of Industrial Injury. The Impact of the Americans with Disabilities Act on the Workers' Compensation Industry, January 14, 1992, Chicago, IL.

ADA's Impact on Workers' Compensation. ADA - Challenges and Opportunities for Occupational Health Progressions, February 8 - 9, 1992, Chicago and May 2 - 3, 1992, Washington, DC.

Performing Independent Medical Evaluations. Sugarloaf Conference, Occupational Health Research, March 23 - 25, 1992, Kingfield, ME.

Strategic Management of Workers' Compensation (with J. Harris). American Occupational Health Conference, May 4, 1992, Washington, DC.

Independent Medical Evaluations (with J. Davis, A. Engelberg, W. Shaw, and R. Blum). Postgraduate Workshop, American Occupational Health Conference, May 5, 1992, Washington, DC.

Workforce 2000: Mental Health Implications (with C. Lippin, L. Warshaw, B. Brown, and A. Shostack). American

Occupational Health Conference, May 7, 1992.
Independent Medical Evaluations: Their Role in Disability Assessment. National Workers' Compensation/Occupational Medicine Seminar, July 21 - 23, 1992, Hyannis, MA.

The Impact of the Americans with Disabilities Act on Workers' Compensation and Occupational Medicine (with J. Gallen). National Workers' Compensation/Occupational Medicine Seminar, July 21 - 23, 1992, Hyannis, MA.

Independent Medical Evaluations. Florida Workers' Compensation Institute, September 14, 1992, Orlando, FL.

The Use and Abuse of the AMA *Guides* in Workers' Compensation Cases (with S. Babitsky). September 18, 1992, Cleveland, OH and October 30, 1992, Boston, MA.

Keynote Presentation. KEY Annual Provider Conference, October 9, 1992, Minneapolis, MN.

Managing Workplace Injuries: An Overview of Patient Tracking and Case Management. Attaining the Optimal Provider-Employer Relationship Conference, October 26, 1992, Washington, DC.

The Occupational Medicine Physician as a Consultant/Problem Solver. ACOEM State of the Art Conference, October 27, 1992, New York, NY.

Independent Medical Evaluation and Disability Assessment. Sixth Annual Scientific Session, American Academy of Disability Evaluating Physicians, November 5, 1992, Dallas, TX.

West Coast Workers' Compensation and Occupational Medicine Conference (medical director), March 18 - 20, 1993, San Francisco, CA.

Strategic Management of Workers' Compensation and Disability (seminar director). American Occupational Health Conference, April 26, 1993, Atlanta, GA.

Impairment Assessment: Practical Aspects (seminar director). American Occupational Health Conference, April 27, 1993, Atlanta, GA.

Rehabilitation of the Injured Worker (session director). American Occupational Health Conference, April 28, 1993, Atlanta, GA.

Twelfth Annual Workers' Compensation and Occupational Medicine Conference (medical director), July 1993, Hyannis, MA.

Fundamentals of Impairment and Dis/ability Evaluations - American College of Occupational and Environmental Medicine (Course Director with H. Roth). Presentations on: Workers' Compensation and Disability Systems, Impairment Evaluation by the *AMA Guides to the Evaluation of Permanent Impairment,* Instrumentation, Causality and Apportionment, Chronic Pain Evaluation, Report Writing, and multiple other topics.
October 31 - November 1, 1993, Dallas, TX; February 11-12, 1994, St. Petersburg, FL; April 23-24, 1994, Chicago, IL; June 26-27, 1994, Baltimore, MD; October 29-30, 1994, Denver, CO; March 25-26, 1995 Maui; May 6-7, 1995, Las Vegas, NV; September 15-16, 1995, New Orleans, LA; October 28-29, 1995, Seattle, WA; February 22-23, 1996, Orlando, FL; June 19-20, 1996, San Francisco, CA; September 27-28, 1996, Chicago, IL; October 30-31, 1996, Toronto, ON; December 3-4, 1996, Washington, DC; February 14-15, 1997, New Orleans, LA; May 9-10, 1997, Orlando, FL; October 23-24, 1997, Nashville, TN; December 1-2, 1997, San Diego, CA; February 5- 6, 1998, Charlotte, NC; June 4-5, 1998, San Francisco, CA; August 19-20, 1998; Chicago, IL; October 2-3, 1998; Pittsburgh, PA; February 4-5, 1999, Orlando, FL; April 23-24, 1999, New Orleans, LA; June 4-5, 1999, Denver, CO, August 1999, Minneapolis, MN

Fitness for Duty Evaluation (course director), General Motors Corporation, January 9-10, 1994, Palm Springs, CA.

West Coast Workers' Compensation and Occupational Medical Conference (medical director), March 1994, San Francisco, CA.

Americans with Disabilities Act and Workers' Compensation (with R. Sampson), Workers' Compensation Update. May 1994, Baltimore, MD.

Product Development. Ryan Associates Seminar, May 1994, Philadelphia, PA.

Evaluating Work-Relatedness: Challenges and Opportunities *and* Making Sense of Chronic Pain: Assessing the Unassessable. Current Topics in Occupational and Environmental Medicine, June 1994, Lansing, MI.

Thirteenth Annual Workers' Compensation and Occupational Medicine Conference (medical director), July 1994.

Examining the Examining Physician. 103rd Annual Meeting of the American Academy of Insurance Medicine, September 26, 1994, Chicago.

The AMA Guides. Annual Conference of the Maryland Workers' Compensation Educational Association, October 3, 1994, Ocean City, Maryland.

Evaluation and Management of Low Back Disability. Washington Business Group of Health's Disability Management Conference, October 17, 1994, Washington, D.C.

Advanced Topics in Impairment and Dis/Ability Evaluation - American College of Occupational and Environmental Medicine (Course Director) Presentations on: Chronic Pain Evaluation, Pain and Psychological Inventories, Performance of Independent Medical Evaluations, Deposition and Testimony as an Expert Medical Witness, and other topics.
March 27-28, 1995, Maui; June 11-12, 1995, Atlanta, GA; September 17-18, 1995, New Orleans; February 24-25, 1996, Orlando, FL; June 21-22, 1996, San Francisco, CA; September 29-30, 1996, Chicago, IL; November 1-2, 1996, Toronto, ON; December 5-6, 1996, Washington, DC; February 16-17, 1997, New Orleans, LA; May 11-12, 1997, Orlando, FL; October 25-26, 1997, Nashville, TN; December 3-4, 1997, San Diego, CA; February 7-8, 1998, Charlotte, NC; June 6-7, 1998, San Francisco, CA; August 21-22, 1998; Chicago, IL; October 4-5, 1998, Pittsburgh, PA; February 6-7, 1999, Orlando, FL; June 6-7, 1999, Denver, CO, August 1999, Minneapolis, MN, October 1999, San Antonio, TX

Integrated Disability Management, American Occupational Health Conference, May 1995, Las Vegas.

Occupational Rehabilitation, American Occupational Health Conference, May 1995, Las Vegas.

Fourteenth Annual Workers' Compensation and Occupational Medicine Conference (Medical Director), July 1995.

Evaluating Dis/Ability: The Role of the Non-Occupational Physician, Academy of Medicine, October 10, 1995, Newark, DL.

Upper and Lower Extremity Impairment Evaluation, University of Washington, October 27, 1995, Everett, WA.

Red-Flags: Approaches to Disability Management, Union Pacific, November 4, 1995, Napa, CA.

How to Be an Effective Medical Witness. Presentations on: What All Medical Experts Should Be Prepared to Testify About, How to Write an Expert Medical Report, How to Prepare to Testify at Your Deposition, Direct and Cross Examination of the Medical Expert Witness, November 11, 1995, Columbus, OH.

Independent Medical Examinations: Maximizing the Benefits, The Essentials of Medical Case Management, February 12-14, 1996, Aspen, CO.

Medical Legal Evaluations. Travelers Low Back Symposium, March 11, 1996, St. Louis, MO.

Independent Medical Examinations. Travelers Low Back Symposium, March 13, 1996, St. Louis, MO.

Disability / Impairment Assessment - The Leading Edge, Central States Occupational Medicine Association, March 15, 1996, Chicago, IL.

How to Succeed as a Medical Witness, National Workers' Compensation and Occupational Medicine Seminar, March 20-22, 1996, San Francisco, CA.

AMA Guides to the Evaluation of Permanent Evaluations Seminar, April 13, 1996, Burlington, VT.

The Future of Occupational Medicine and Workers' Compensation in the United States (Keynote Presentation), and Use of the *AMA Guides to the Evaluation of Permanent Impairment*, Royal College of Australiasian Physicians, May 6-8, 1996, Canberra, Australia.

Fifteenth Annual Workers' Compensation and Occupational Medicine Conference (Medical Director), July 1996.

Ethical Issues in Workers' Compensation and Occupational Medicine, National Workers' Compensation and Occupational Medicine Seminar, July 17, 1996, Hyannis, MA.

Independent Medical Examinations: Maximizing the Benefits, The Essentials of Medical Case Management, October 1-2, 1996, San Diego, CA.

Use of the AMA *Guides to the Evaluation of Permanent Impairment*, Seminar Director, October 5 - 6, 1996, Wailea, Maui, HI.

Advanced Course on Impairment Evaluation, Seminar Director, October 19-20, 1996, Seattle, WA.

Integrated Disability Management and Managed Care, State of the Art Conference, American College of Occupational and Environmental Medicine, October 27, 1996, Toronto, ON.
Workers' Compensation Management and Managed Care, Seminar Director, State of the Art Conference, American College of Occupational and Environmental Medicine, October 28, 1996, Toronto, ON.

How to Be an Effective and Successful Independent Medical Examiner, Seminar Leader
January 18-21, 1997, Maui, HI, February 22 - 25, 1997, Ft. Lauderdale, FL, April 12 - 15, 1997, Chicago, IL, April 17 - 20, 1997, Seattle, WA, August 9 - 12, 1997, Hyannis, MA, March 19 - 22, 1998, Maui, HI, April 16 - 19, 1998, April 30 - May 3, 1998, San Diego, CA, June 20 - 23, 1998, Hyannis, MA, April 17-18, 1999, Ft. Lauderdale, FL, June 26 – 27, 1999, Hyannis, MA, July 13-14, 2000, Hyannis, MA.

Independent Medical Evaluations, Impairment Ratings and Medical-Legal Issues, Seminar Director, Province of Alberta, Calgary, Alberta, February 1 - 2, 1997.

Choices: Performance vs. Disability, Delayed Recovery: Recognition and Management of the Individual at Risk, Reed Conference, February 10 - 12, 1997, Aspen, CO, April 8 - 9, 1997, Chicago, IL.

Workers' Compensation and Occupational Medicine Conference (Medical Director), San Francisco, CA, March 5 - 7, 1998.

Use of the AMA *Guides*, State of Nevada, March 15 - 17, 1997, Las Vegas, NV.

American Occupational Health Conference, General Conference Chair, May 9 - 16, 1997, Orlando, FL.

Sixteenth Annual Workers' Compensation and Occupational Medicine Conference (Medical Director), Hyannis,

MA, July 22 - 24, 1997.

Workers' Compensation and Occupational Medicine Conference (Medical Director), San Francisco, CA, March 11 - 13, 1998.

Refresher in Impairment and Dis/*Ability* Evaluation, April 25, 1998, Boston, MA; October 16, 1998, Phoenix, AZ.

Eighteenth Annual Workers' Compensation and Occupational Medicine Conference (Medical Director), Hyannis, MA, July 21 - 23, 1998.

Choices: Performance vs. Disability, Seventeen Annual Workers' Compensation and Occupational Medicine Conference, Hyannis, MA, July 23, 1998.

IME Summit (Seminar Director), SEAK, Inc., Hyannis, MA, July 25 – 26, 1998.

Impairment and Disability Evaluation: An Intensive 2 Day Seminar for Chiropractors, Chicago, IL, September 11 - 12, 1998.

Principles and Practice of Musculoskeletal Impairment Evaluation: Case Study Approach (Seminar Director), Spokane, October 9, 1998.

Principles and Practice of Musculoskeletal Impairment Evaluation: Case Study Approach (Seminar Director), Seattle, October 10, 1998.

Advanced Skills: Legal Issues and Case Studies / Update in Impairment and Disability: Preparing for Certification, Seattle, October 11, 1998.

IME Best Practices (Seminar Director), SEAK, Inc., Atlanta, GA, October 27, 1998.

Delayed Recovery: Best Practices (Co Director and Speaker), SEAK, Inc. Atlanta, GA, October 28- 29, 1998.

Delayed Recovery: Choices, UNUM, Portland, ME, February 1999.

Symptom Magnification, Malingering and Fraud, Workers' Compensation and Occupational Medicine Pre-Conference, San Diego, CA, March 23, 1999.

Eighth Workers' Compensation and Occupational Medicine Conference (Medical Director), San Diego, CA March 24-25, 1999.

IME Best Practices, Ford Motor Company, Dearborn, MI, June 9, 1999.

IME Best Practices, SEAK, Inc., Hyannis, MA, July 19, 1999.

Nineteenth Annual Workers' Compensation and Occupational Medicine Conference (Medical Director), SEAK, Inc., Hyannis, MA, July 20 – 22, 1999.

IME Summit (Seminar Director), SEAK, Inc., Hyannis, MA, July 24 - 25, 1999.

The Successful Independent Medical Examiner, American College of Occupational and Environmental Medicine State-of-the-Art Conference, San Antonio, TX, October 18, 1999.

Use of the *AMA Guides to the Evaluation of Permanent Impairment, Fourth Edition.* State of New Hampshire Hearing Officers and Appeal Court Judges. Concord, NH, December 6, 1999.

Independent Medical Evaluations: Achieving Excellence, General Motors Corporation Occupational Health Conference, Palm Springs, CA, January 15-16, 2000.

Delayed Recovery: What Works, Workers' Compensation and Occupational Medicine Pre-Conference, San Diego, CA March 28, 2000.

Independent Medical Evaluation Best Practices: Achieving Excellence in IME Management, Workers' Compensation and Occupational Medicine Conference, San Diego, CA March 29, 2000.

Ninth Annual Workers' Compensation and Occupational Medicine Conference (Medical Director), San Diego, CA March 29 - 31, 2000.

AMA *Guides*: Use and Abuse, Reed Group, Orlando, Fl, March 30 – 31, 2000.

AMA *Guides*: Training Course for the Dis/ability Evaluator (ABIME), (multiple presentations) Chicago, IL, April 1, 2000, Chicago, IL, July 8-9, 2000, Brisbane, Australia, September 4-5, 2000.Chicago, IL, October 7-8, 2000.

Use of the AMA *Guides*, New York Workers' Compensation Conference, Albany, NY, June 1-2, 2000.

Evaluating Impairment – Use of the AMA *Guides*: A Case Study Approach, (multiple presentations) Philadelphia, PA, May 13 – 14, 2000, San Diego, CA, June 8-9, 2000, Chicago, IL, September 7-8, 2000, Orlando, FL, February 3, 2001.

Advanced Concepts in Impairment and Dis/ability Evaluation: Critical Knowledge and Skills, (multiple presentations), American College of Occupational and Environmental Medicine, San Diego, CA, June 10-11, 2000, Chicago, IL, September 9-10, 2000, Nashville, TN, October 26-27, 2000.

How to Be an Effective and Successful Independent Medical Examiner, Seminar Leader, Hyannis, MA, July 13-14, 2000, Hyannis, MA, July 12-13, 2001

Delayed Recovery: What Works, Workers' Compensation and Occupational Medicine Pre-Conference, Hyannis, MA, July 24, 2000, San Diego, CA, March 27, 2001, Hyannis, MA, July 23, 2001

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