Title: Improving Accuracy in *AMA Guides* Impairment Rating: A New Approach to Determining True Impairment Functional Loss in the 5th Edition

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In the realm of workers' compensation settlements, the assessment of impairment plays a pivotal role when an injured worker reaches Maximum Medical Improvement (MMI), the recovery state in which the medical condition is not anticipated to improve meaningfully in the following 12 months. This reporting process, known as the impairment evaluation, relies on a combination of an injured worker's medical history, physical examination, and diagnostic tests, which are then translated into a whole-person impairment (WPI) score using the *American Medical Association's Guide to Permanent Impairment* (*AMA Guides*). The WPI value is used as a proxy for determining the individual's actual functional loss with regards to performing one's activities of daily living (ADLs). Subsequently, the WPI is factored into an administrative formula to determine the permanent disability (PD) associated with the injury, facilitating its financial settlement according to state guidelines.

Since the inception of the *AMA Guides* in 1958, the traditional approach to impairment rating has faced persistent issues, including inaccuracies, incomplete documentation, non-compliance with physical measurements, and a lack of internal validation methods. These shortcomings have led to disputes over impairment reports, delayed settlements, litigation, and increased costs for all stakeholders involved in the United States workers' compensation system, particularly in California, as highlighted in the *RAND Report on Impairment Rating*.

This paper aims to uncover the blind spots that have compromised the accuracy and consistency in this multibillion-dollar industry, resulting in confusion, inefficiency, and delays. To address these challenges, we introduce and validate a novel approach for directly measuring functional loss. This approach seeks to establish validated "impairment signatures," the use of which should benefit patients, physicians, insurance carriers, and state-regulated administrative bodies. Ultimately, it enables the identification of pricing biases, errors in impairment ratings, and variations in access to treatment and impairment outcomes. These signatures also illuminate rate differences for services in geographically comparable regions, which will help all stakeholders accurately project human resource costs and allocate resource reserves. This will bring about cost savings that benefit society as a whole.

Within this context, we propose several key tenets for improving the speed, ease, and cost efficiency of workers' compensation injury settlements:

1. Standardized analysis for scoring pain/symptoms and loss of function
2. Standardized calculation methods for physical examinations and diagnostic testing that adhere to the conventional four corners rating (FCR) method detailed in the *AMA Guides.*
3. An analytical approach to calculate WPI scores directly from losses in ADLs, known as the "functional loss rating" (FLR)

4. A correction factor to fix the problem inherent in the conventional FCR method, in which knee cases often have incorrectly elevated WPI ratings when elements of surgery or arthritis are identified.
5. The introduction of a method to create a database for research and data augmentation that will aid to standardize both settlement modeling and predictive cost reserves, thereby enhancing the efficiency and accuracy of benefits delivery and instilling confidence in settlements.
6. A standardized approach to data analysis—the FLR method introduced here—that:

- Critically examines the accuracy and potential errors in the *AMA Guides* and
- Facilitates corrections to the tables and figures relied upon for medical impairment assessments and the subsequent settlement of injuries.

This paper details how the FLR advances methods for measuring medical impairment by using a computational method based directly on functional loss. It lays the foundation for further research into the accuracy of current statistical data analysis of all impairment medicine, including personal injuries, state and government disability evaluations, and related legal systems, including workers' compensation systems.

The *AMA Guides*, often considered the gold standard in determining functional loss, serves as the basis for a system that enables medical professionals to convert clinical history, physical examination findings, and diagnostic tests into a single WPI value. Furthermore, the *AMA Guides* also specifies a relationship between the whole-person value and ADL loss. However, the direct calculation of ADL loss requires an independent method for scaling and interpolating each ratable body system and its subcomponents, all while adhering to the administrative boundaries set by the *AMA Guides*. In this paper, we will provide clinical data demonstrating the FLR formula as a more efficient and significantly improved alternative to the traditional FCR method currently employed in workers' compensation claim settlements.

In summary, this paper investigates the internal consistency and validity of the FCR reporting method, the current industry standard. It also proposes the new FLR method, which builds upon the *AMA Guides* to establish a new system that allows medical professionals to convert functional ADL loss directly into a WPI value. This innovative approach, as demonstrated by direct clinical data analysis, offers a faster, less expensive, and significantly improved alternative to the traditional *AMA Guides* impairment method used in claim settlements.

Methods

The FLR method presented here improves upon the FCR method currently in use in terms of cost, efficiency, and accuracy. In the FLR approach, the WPI uses an "impairment signature," determined from the doctor's case report, that quantitatively describes aspects of both the pain/symptoms and the activities/functional loss that a patient experiences. As seen in the accompanying tables, the impairment signature consists of numbers for (a) pain/symptom severity value, PV, (b) pain/symptom frequency, PF, (c) pain-only ADLs, ADL_P and (d) limited ADLs, ADL_L.

The impairment signature is used to calculate the FLR as follows:

$$FLR = \frac{MIV_{bp}}{10}\left\{\frac{(PV)(PF) + ADL_{eff} * \frac{10}{34}}{2}\right\}$$

The "effective ADL count" is defined by:

$$ADL_{eff} \equiv \frac{1}{2}(ADL_P) + ADL_L$$

"MIV_{bp}" refers to the maximum impairment value of the relevant body part, as given in the *AMA Guides* by:

$$MIV_{bp} = \begin{cases} 54\ (shoulder) \\ 97\ (lumbar\ spine) \\ 32\ (knee) \end{cases}$$

Results: Tables and Graphs

To be considered consistent, the difference between the ratings found by the two methods must not exceed 10% of the maximum impairment value of the body part in question, according to page 20 of the *AMA Guides*. The difference between the ratings for each case is included in the rightmost column in each of the tables below, and that information is also displayed in the corresponding graphs that follow. Tables 1, 2, and 3 display data for the shoulder, lumbar spine, and knee, respectively. Table 4 displays the supplemental data for the knee that was added to validate the accuracy of the correction factor discussed below.

As seen in the tables and the corresponding graphs, the FLR is consistent with the FCR in all of the 73 shoulder cases studied (100%) and 54 of the 56 lumbar spine cases (96.4%), but only 32 of the 50 knee cases (64.0%) originally investigated. Traditionally, with the FCR method, the data analysis shows the WPI to be elevated above the FLR rating particularly when arthritis and/or surgery is involved, even if there is little or no actual functional loss. This means the FCR's WPI was produced in absence of reported functional loss.

In this study it is proposed that a "universal knee correction factor" may be applied to the FCR values for the knee (specifically, the original FCR values should be divided by 3.2) to compensate for the elevation of FCR knee values when using the traditional method of impairment rating. This elevation in FCR knee values often occurs when surgery and/or arthritis is involved, even in cases where there is minimal or no functional loss. When the correction factor has been applied, the FLR is then shown to be consistent in 100% of the knee cases, and therefore is exceptionally consistent with the FCR method for each body part considered.

To verify the accuracy of this correction factor, an additional 23 knee cases were investigated, with this supplemental data displayed in Table 4 and Graph 4. The FLR is consistent with the FCR in only 16 of these additional 23 knee cases (69.6%) when the correction factor is not applied, but once again, the two methods are in 100% agreement applying the universal knee corrective factor of 3.20 to the FCR values. These results are interpreted as verifying not only that the traditional FCR method gives elevated WPI values for the knee, but that it does so in a consistent, predictable manner.

The FLR method has been shown to be a reliable alternative to the traditional FCR method of impairment rating for the shoulder and lumbar spine. Furthermore, it has been shown to provide a more accurate assessment of impairment for the knee, since it focuses more on functional loss than the FCR method does.

Tables:

Case Number	Impairment Signature				Apportionment Value	WPI		ΔWPI (FLR-FCR)
	Pain Value	Pain Frequency	ADL_P	ADL_L		FCR	FLR	
1	2	1	1	7	33	4.69	7.37	2.68
2	1	1	0	1	14	4.30	2.58	-1.72
3	1	1	0	2	0	5.00	4.00	-1.00
4	1	1	0	0	0	0.00	0.00	0.00
5	1	1	1	0	0	0.00	3.00	3.00
6	1	1	1	0	0	0.00	3.00	3.00
7	1	1	0	0	39	0.61	0.00	-0.61
8	1	1	0	1	14	4.30	2.58	-1.72
9	1	1	0	1	0	5.00	3.00	-2.00
10	1	1	0	2	0	5.00	4.00	-1.00
11	1	1	1	0	0	0.00	3.00	3.00
12	1	1	1	0	0	0.00	3.00	3.00
13	1	1	0	1	0	7.00	3.00	-4.00
14	1	1	1	0	14	1.72	2.58	0.86
15	1	1	0	4	0	4.00	6.00	2.00
16	1	1	0	4	0	4.00	6.00	2.00
17	1	1	0	1	14	4.30	2.58	-1.72
18	1	1	0	1	14	1.72	2.58	0.86
19	1	1	0	1	14	1.72	2.58	0.86
20	1	1	0	0	0	0.00	0.00	0.00
21	0	0	0	0	40	5.40	0.00	-5.40
22	1	1	0	1	14	1.72	2.58	0.86
23	3	1	7	7	0	17.00	16.00	-1.00
24	1	1	0	3	36	4.48	3.20	-1.28
25	1	1	1	1	0	1.00	4.00	3.00
26	1	1	0	2	0	4.00	4.00	0.00
27	1	1	0	1	0	1.00	3.00	2.00
28	1	1	1	0	0	0.00	3.00	3.00
29	1	1	0	1	39	0.61	1.83	1.22
30	1	1	0	1	0	4.00	3.00	-1.00
31	1	1	3	0	0	2.00	4.00	2.00
32	1	1	0	1	0	3.00	3.00	0.00
33	1	1	0	2	0	4.00	4.00	0.00
34	1	1	3	2	0	5.00	5.00	0.00
35	1	1	0	0	14	0.86	0.00	-0.86
36	1	1	0	0	0	0.00	0.00	0.00
37	0	0	0	0	39	3.66	0.00	-3.66
38	1	1	0	1	95	0.40	0.15	-0.25
39	1	1	0	1	14	1.72	2.58	0.86
40	1	1	2	1	15	1.70	3.40	1.70
41	1	1	0	0	39	1.22	0.00	-1.22
42	1	1	0	3	14	6.02	4.30	-1.72
43	1	1	1	0	0	3.00	3.00	0.00
44	1	1	0	2	0	5.00	4.00	-1.00
45	1	1	0	0	0	1.00	0.00	-1.00
46	1	1	1	0	0	1.00	3.00	2.00
47	1	1	1	0	0	1.00	3.00	2.00
48	1	1	0	0	0	0.00	0.00	0.00
49	1	1	0	0	0	1.00	0.00	-1.00
50	1	1	0	0	0	1.00	0.00	-1.00
51	1	1	4	0	14	0.86	3.44	2.58
52	1	1	0	0	0	2.00	0.00	-2.00
53	1	1	0	2	14	4.30	3.44	-0.86
54	1	1	0	1	0	1.00	3.00	2.00
55	1	1	0	1	0	1.00	3.00	2.00
56	1	1	1	0	0	0.00	3.00	3.00
57	1	1	3	3	0	10.00	6.00	-4.00
58	1	1	3	3	0	10.00	6.00	-4.00
59	1	1	1	0	14	0.86	2.58	1.72
60	1	1	0	0	0	3.00	0.00	-3.00
61	1	1	0	1	95	0.80	0.15	-0.65
62	1	1	0	2	0	5.00	4.00	-1.00
63	1	1	0	2	0	5.00	4.00	-1.00
64	0	0	0	0	15	0.85	0.00	-0.85
65	1	1	0	0	0	0.00	0.00	0.00
66	1	1	0	1	0	2.00	3.00	1.00
67	1	1	0	4	0	5.00	6.00	1.00
68	1	1	0	4	0	5.00	6.00	1.00
69	3	1	0	9	11	8.01	13.35	5.34
70	1	1	3	0	0	5.00	4.00	-1.00
71	1	1	0	4	0	4.00	6.00	2.00
72	1	1	0	4	0	4.00	6.00	2.00
73	1	1	1	0	0	2.00	3.00	1.00
							Average:	0.16
							Standard Deviation:	2.02
							10% of Maximum Impairment Value for Shoulder:	5.40

Table 1: A Comparison of WPI Ratings for the Shoulder. All FCR and FLR WPI values fall within 5.4 of each other, i.e., 10% of 54, the maximum impairment value for the shoulder as per the *AMA Guides*.

Case Number	Impairment Signature				Apportionment Value	WPI		ΔWPI (FLR-FCR)
	Pain Value	Pain Frequency	ADL_P	ADL_L		FCR	FLR	
1	1	1	0	3	52	2.40	4.32	1.92
2	1	1	0	1	30	7.00	4.20	-2.80
3	1	1	2	3	40	9.00	6.60	-2.40
4	1	1	0	1	97	0.51	0.18	-0.33
5	1	1	0	2	63	6.66	2.96	-3.70
6	1	1	2	0	93	1.12	0.42	-0.70
7	1	1	0	3	37	8.19	5.67	-2.52
8	1	1	3	0	0	0.00	7.00	7.00
9	1	1	0	0	0	1.00	0.00	-1.00
10	1	1	0	2	0	10.00	8.00	-2.00
11	1	1	0	1	0	15.00	6.00	-9.00
12	1	1	0	0	0	0.00	0.00	0.00
13	1	1	4	4	0	10.00	13.00	3.00
14	1	1	0	0	63	5.55	0.00	-5.55
15	1	1	0	2	0	6.00	8.00	2.00
16	1	1	0	2	63	5.18	2.96	-2.22
17	1	1	0	3	0	9.00	9.00	0.00
18	0	0	0	0	0	5.00	0.00	-5.00
19	1	1	1	3	0	7.00	10.00	3.00
20	1	1	2	4	60	9.60	4.80	-4.80
21	1	1	0	0	0	0.00	0.00	0.00
22	1	1	2	0	0	1.00	6.00	5.00
23	1	1	2	0	63	3.70	2.22	-1.48
24	1	1	0	2	0	11.00	8.00	-3.00
25	1	1	2	0	30	3.50	4.20	0.70
26	1	1	2	0	0	14.00	6.00	-8.00
27	1	1	0	0	0	5.00	0.00	-5.00
28	1	1	0	0	0	5.00	0.00	-5.00
29	1	1	3	0	0	7.00	7.00	0.00
30	1	1	0	1	90	1.90	0.60	-1.30
31	1	1	0	1	0	9.00	6.00	-3.00
32	1	1	0	0	0	0.00	0.00	0.00
33	1	1	0	0	0	0.00	0.00	0.00
34	1	1	2	0	0	1.00	6.00	5.00
35	**1**	**1**	**0**	**4**	**0**	**21.00**	**11.00**	**-10.00**
36	1	1	5	0	0	1.00	8.00	7.00
37	1	1	0	0	0	0.00	0.00	0.00
38	1	1	3	1	30	9.80	5.60	-4.20
39	1	1	1	6	60	6.00	5.60	-0.40
40	1	1	0	3	63	5.18	3.33	-1.85
41	1	1	0	0	0	1.00	0.00	-1.00
42	1	1	0	8	27	18.25	11.68	-6.57
43	0	1	0	0	0	0.00	0.00	0.00
44	1	1	0	3	86	3.22	1.26	-1.96
45	1	1	0	1	30	9.10	4.20	-4.90
46	1	1	0	2	30	11.90	5.60	-6.30
47	1	1	5	5	60	8.80	6.40	-2.40
48	**1**	**1**	**7**	**1**	**0**	**1.00**	**11.00**	**10.00**
49	1	1	0	0	0	1.00	0.00	-1.00
50	1	1	2	0	30	1.40	4.20	2.80
51	1	1	0	1	0	1.00	6.00	5.00
52	1	1	5	5	0	14.00	16.00	2.00
53	1	1	7	2	60	5.60	5.20	-0.40
54	1	1	1	1	55	4.05	3.15	-0.90
55	1	1	0	1	0	6.00	6.00	0.00
56	1	1	2	0	97	0.36	0.18	-0.18
							Average:	**-1.01**
							Standard Deviation:	**3.90**
							10% of Maximum Impairment Value for Lumbar Spine:	**9.70**

Table 2: A Comparison of WPI Ratings for the Lumbar Spine. The only cases where the FCR and FLR value are not within 10% are highlighted and in bold. In all other cases, the FCR and FLR WPI values fall within 9.7 of each other, i.e., 10% of 97, the maximum impairment value for the lumbar spine as per the *AMA Guides*.

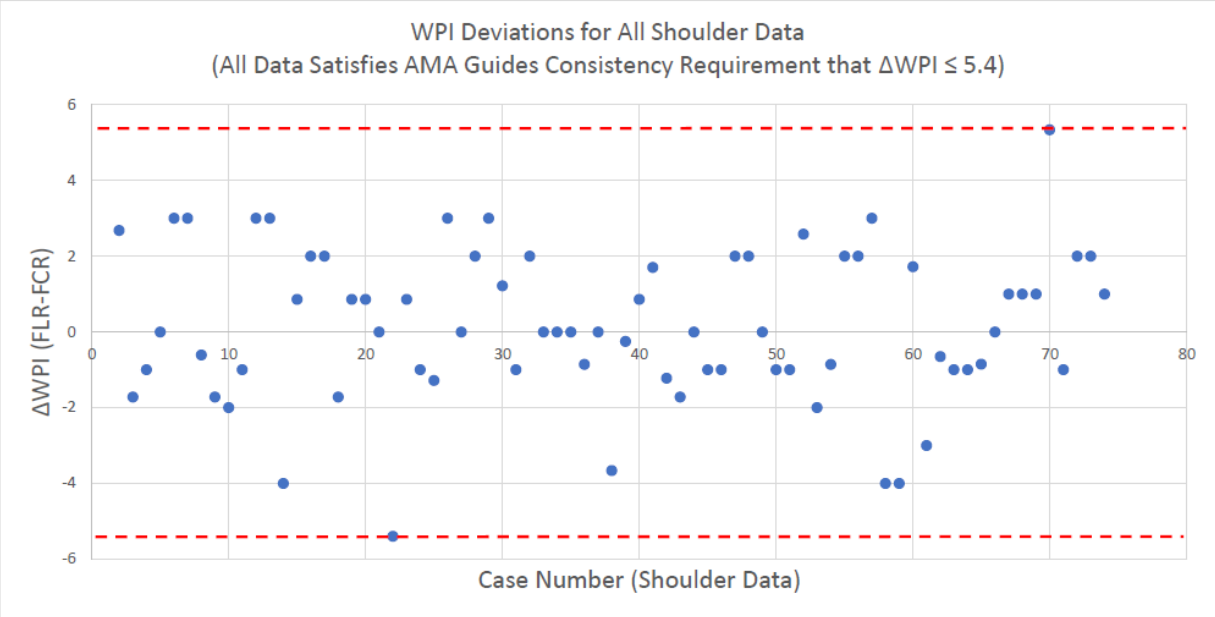
Case Number	Impairment Signature				Apportionment Value	WPI		ΔWPI (FLR-FCR)	WPI (With FCR Divided by Correction Factor of 3.20)		ΔWPI (FLR-FCR)
	Pain Value	Pain Frequency	ADL_P	ADL_L		FCR	FLR		Corrected FCR	FLR	
1	**1**	**1**	**1**	**0**	**72**	**4.20**	**0.56**	**-3.64**	1.31	0.56	-0.75
2	1	1	0	1	0	3.00	2.00	-1.00	0.94	2.00	1.06
3	1	1	0	1	0	3.00	2.00	-1.00	0.94	2.00	1.06
4	**1**	**1**	**1**	**1**	**54**	**7.36**	**0.92**	**-6.44**	2.30	0.92	-1.38
5	1	1	3	0	0	0.00	2.00	2.00	0.00	2.00	2.00
6	1	1	2	2	38	4.96	1.86	-3.10	1.55	1.86	0.31
7	2	1	0	4	0	6.00	5.00	-1.00	1.88	5.00	3.13
8	**1**	**1**	**1**	**0**	**45**	**13.20**	**1.10**	**-12.10**	4.13	1.10	-3.03
9	1	1	0	1	85	2.70	0.30	-2.40	0.84	0.30	-0.54
10	1	1	1	0	0	0.00	2.00	2.00	0.00	2.00	2.00
11	**1**	**1**	**2**	**0**	**48**	**7.28**	**1.04**	**-6.24**	2.28	1.04	-1.24
12	**1**	**1**	**1**	**0**	**48**	**6.76**	**1.04**	**-5.72**	2.11	1.04	-1.07
13	1	1	1	0	0	0.00	2	2.00	0.00	2.00	2.00
14	1	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
15	1	1	1	1	38	2.48	1.24	-1.24	0.78	1.24	0.47
16	1	1	1	0	38	3.72	1.24	-2.48	1.16	1.24	0.08
17	1	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
18	**1**	**1**	**1**	**0**	**51**	**5.88**	**0.98**	**-4.90**	1.84	0.98	-0.86
19	**1**	**1**	**2**	**0**	**38**	**6.20**	**1.24**	**-4.96**	1.94	1.24	-0.70
20	1	1	0	1	0	1.00	2.00	1.00	0.31	2.00	1.69
21	1	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
22	1	1	1	2	24	2.28	2.28	0.00	0.71	2.28	1.57
23	**2**	**1**	**2**	**3**	**35**	**12.35**	**3.25**	**-9.10**	3.86	3.25	-0.61
24	**2**	**1**	**1**	**3**	**35**	**9.10**	**3.25**	**-5.85**	2.84	3.25	0.41
25	1	1	0	0	14	2.58	0.00	-2.58	0.81	0.00	-0.81
26	1	1	1	0	14	2.58	1.72	-0.86	0.81	1.72	0.91
27	**1**	**1**	**0**	**1**	**38**	**4.96**	**1.24**	**-3.72**	1.55	1.24	-0.31
28	1	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
29	**1**	**1**	**0**	**3**	**38**	**12.40**	**1.86**	**-10.54**	3.88	1.86	-2.02
30	**1**	**1**	**0**	**3**	**85**	**4.05**	**0.45**	**-3.60**	1.27	0.45	-0.82
31	1	1	2	0	0	1.00	2.00	1.00	0.31	2.00	1.69
32	1	1	0	0	14	2.58	0.00	-2.58	0.81	0.00	-0.81
33	1	1	1	0	0	0.00	2.00	2.00	0.00	2.00	2.00
34	1	1	0	1	0	3.00	2.00	-1.00	0.94	2.00	1.06
35	1	1	1	0	88	2.04	0.24	-1.80	0.64	0.24	-0.40
36	1	1	1	2	14	2.58	2.58	0.00	0.81	2.58	1.77
37	1	1	0	2	38	3.72	1.86	-1.86	1.16	1.86	0.70
38	**1**	**1**	**0**	**1**	**38**	**5.58**	**1.24**	**-4.34**	1.74	1.24	-0.50
39	1	1	1	1	0	3.00	2.00	-1.00	0.94	2.00	1.06
40	1	1	0	2	0	3.00	3.00	0.00	0.94	3.00	2.06
41	1	1	0	1	14	2.58	1.72	-0.86	0.81	1.72	0.91
42	**1**	**1**	**2**	**0**	**38**	**6.20**	**1.24**	**-4.96**	1.94	1.24	-0.70
43	1	1	1	0	14	3.44	1.72	-1.72	1.08	1.72	0.65
44	1	1	0	2	14	2.58	2.58	0.00	0.81	2.58	1.77
45	**1**	**1**	**2**	**2**	**54**	**4.60**	**1.38**	**-3.22**	1.44	1.38	-0.06
46	**1**	**1**	**0**	**0**	**48**	**6.76**	**0.00**	**-6.76**	2.11	0.00	-2.11
47	**1**	**1**	**2**	**0**	**0**	**8.00**	**2.00**	**-6.00**	2.50	2.00	-0.50
48	**1**	**1**	**0**	**1**	**83**	**3.74**	**0.34**	**-3.40**	1.17	0.34	-0.83
49	1	1	1	1	0	3.00	2.00	-1.00	0.94	2.00	1.06
50	1	1	1	2	0	6.00	3.00	-3.00	1.88	3.00	1.13
							Average:	-2.52			0.25
							Standard Deviation:	3.15			1.28
					10% of Maximum Impairment Value for Knee:			3.20			3.20

Table 3: A Comparison of WPI Ratings for the Knee: *Original Data*. Cases where the FCR and FLR value are not within 10% are highlighted and in bold. In all other cases, the FCR and FLR WPI values fall within 3.2 of each other, i.e., 10% of 32, the maximum impairment value for the knee as per the *AMA Guides*. As seen in the two rightmost columns, once the correction factor is applied to the FCR values, there is 100% agreement between the FCR and FLR values in all cases considered. (The FLR column is repeated on the far right for the convenience of the reader.)

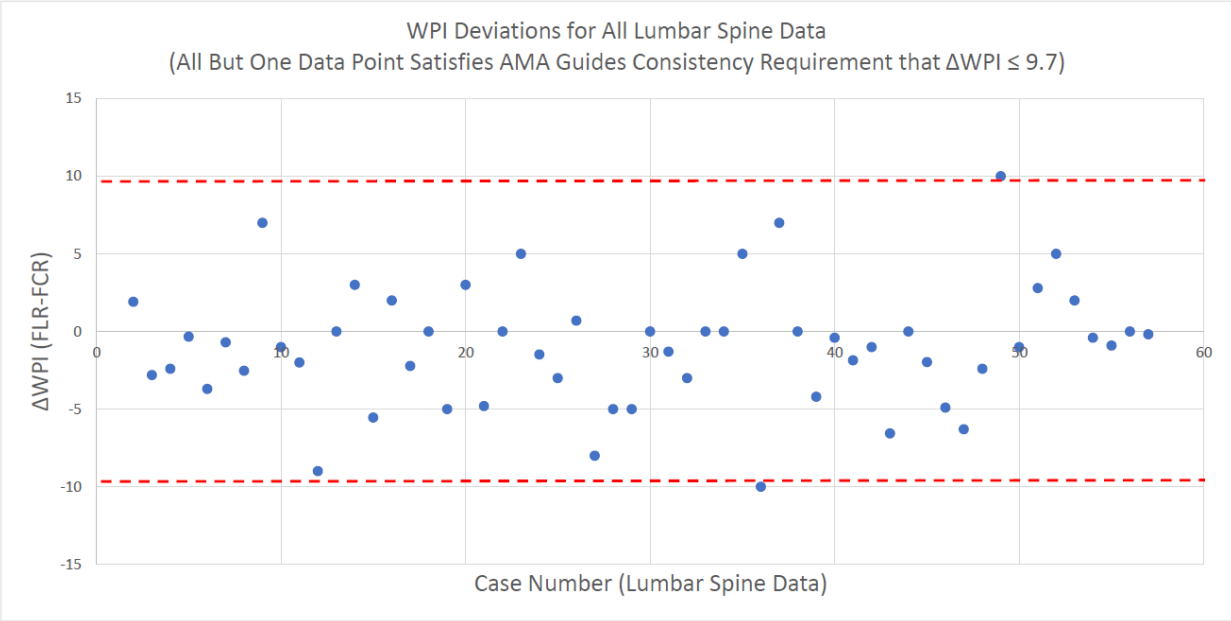
Case Number	Impairment Signature				Apportionment Value	WPI		ΔWPI (FLR-FCR)	WPI (With FCR Divided by Correction Factor of 3.20)		ΔWPI (FLR-FCR)
	Pain Value	Pain Frequency	ADL_P	ADL_L		FCR	FLR		Corrected FCR	FLR	
51	1	1	0	0	0	0	0	0.00	0.00	0.00	0.00
52	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
53	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
54	1	1	0	2	14	2.58	2.58	0.00	0.81	2.58	1.77
55	**1**	**1**	**0**	**1**	**37**	**6.3**	**1.26**	**-5.04**	1.97	1.26	-0.71
56	1	1	0	0	0	0	0	0.00	0.00	0.00	0.00
57	**1**	**1**	**0**	**1**	**38**	**4.96**	**1.24**	**-3.72**	1.55	1.24	-0.31
58	1	1	0	3	0	3	3	0.00	0.94	3.00	2.06
59	**1**	**1**	**1**	**0**	**38**	**12.4**	**1.24**	**-11.16**	3.88	1.24	-2.64
60	1	1	0	0	0	0	0	0.00	0.00	0.00	0.00
61	1	1	0	0	0	0	0	0.00	0.00	0.00	0.00
62	1	1	0	1	14	3.44	1.72	-1.72	1.08	1.72	0.65
63	**1**	**1**	**1**	**1**	**0**	**16**	**2**	**-14.00**	5.00	2.00	-3.00
64	1	1	2	0	0	0	2	2.00	0.00	2.00	2.00
65	**1**	**1**	**3**	**0**	**0**	**8**	**2**	**-6.00**	2.50	2.00	-0.50
66	**1**	**1**	**3**	**0**	**0**	**8**	**2**	**-6.00**	2.50	2.00	-0.50
67	1	1	0	3	0	3	3	0.00	0.94	3.00	2.06
68	1	1	0	3	0	3	3	0.00	0.94	3.00	2.06
69	1	1	1	1	14	2.58	1.72	-0.86	0.81	1.72	0.91
70	1	1	0	3	83	3.57	0.51	-3.06	1.12	0.51	-0.61
71	**1**	**1**	**1**	**0**	**14**	**5.16**	**1.72**	**-3.44**	1.61	1.72	0.11
72	0	0	0	0	100	0	0	0.00	0.00	0.00	0.00
73	1	1	2	0	53	3.76	0.94	-2.82	1.18	0.94	-0.24
							Average:	**-2.43**			**0.14**
							Standard Deviation:	**3.89**			**1.32**
							10% of Maximum Impairment Value for Knee:	**3.20**			**3.20**

Table 4: A Comparison of WPI Ratings for the Knee: *Supplemental Data.* Cases where the FCR and FLR value are not within 10% are highlighted and in bold. In all other cases, the FCR and FLR WPI values fall within 3.2 of each other, i.e., 10% of 32, the maximum impairment value for the knee as per the *AMA Guides*. As seen in the two rightmost columns, once the correction factor is applied to the FCR values, there is 100% agreement between the FCR and FLR values in all cases considered. (The FLR column is repeated on the far right for the convenience of the reader.)

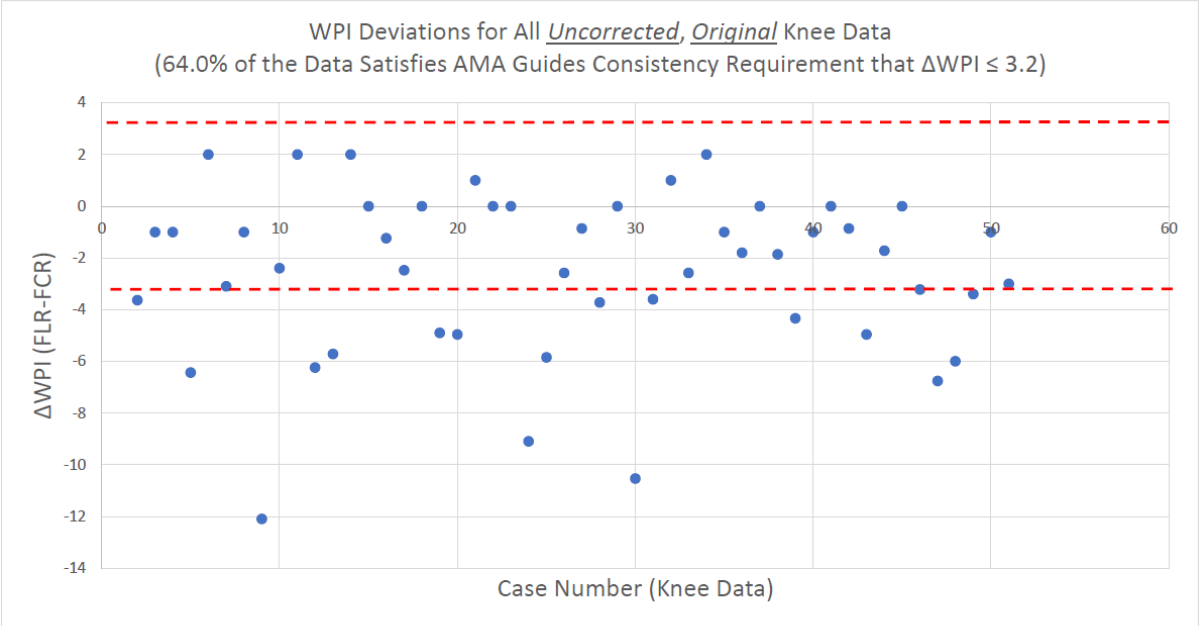
Graphs:

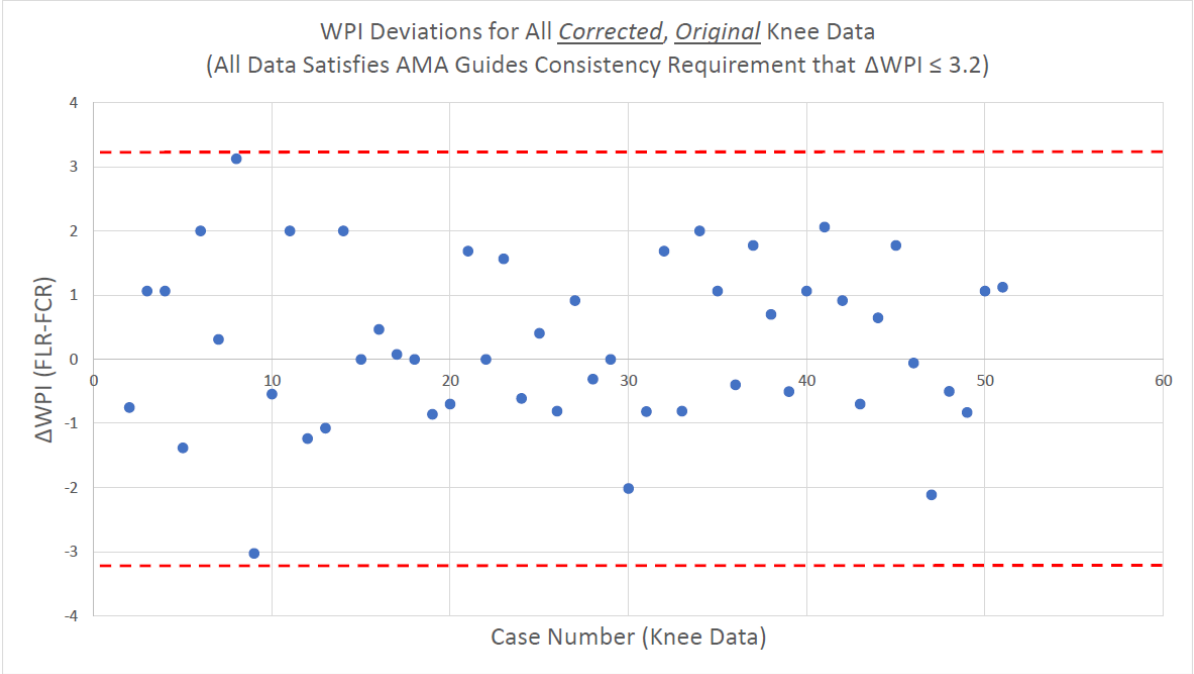


<u>Graph 1</u>: The Deviation in WPI Ratings for the Shoulder. The difference between WPI ratings—FLR – FLC—is shown for all shoulder cases. The dashed lines are guides for the eye, as data points that fall between them satisfy the criterion that the ratings are within 5.4 of each other, i.e., 10% of 54, the maximum impairment value for the shoulder as per the *AMA Guides*. It should be noted that all data points satisfy that requirement.

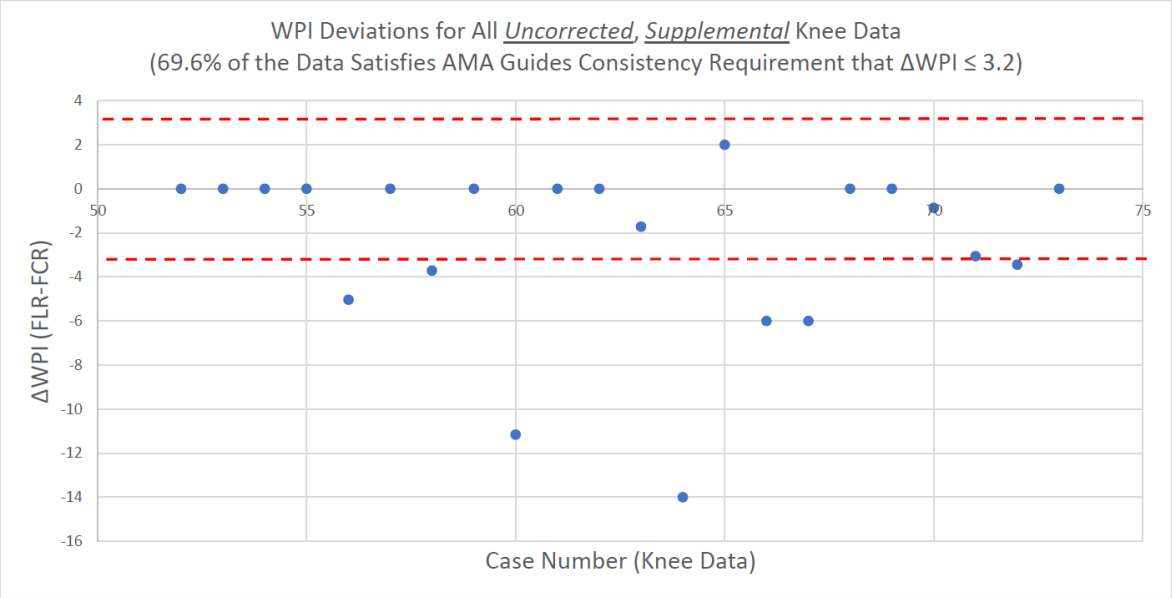


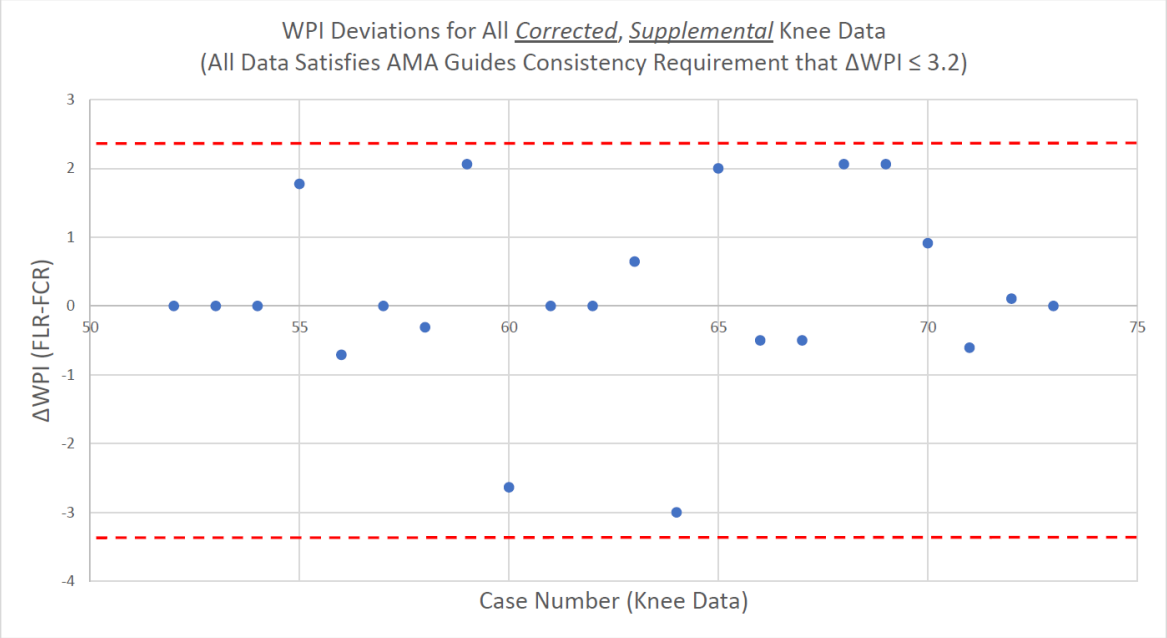
<u>Graph 2</u>: The Deviation in WPI Ratings for the Lumbar Spine. The difference between WPI ratings—FLR – FLC—is shown for all lumbar spine cases. The dashed lines are guides for the eye, as data points that fall between them satisfy the criterion that the ratings are within 9.7 of each other, i.e., 10% of 97, the maximum impairment value for the lumbar spine as per the *AMA Guides*. It should be noted that 54 of the 56 data points (96.4%) satisfy that requirement.





Graphs 3a (top) and 3b (bottom): The Deviation in WPI Ratings for the Knee: *Original Data*. The difference between WPI ratings—FLR – FLC—is shown for all knee cases, with the top graph showing the uncorrected data and the bottom accounting for correction to the FCR knee data presented in this paper. The dashed lines are guides for the eye, as data points that fall between them satisfy the criterion that the ratings are within 3.2 of each other, i.e., 10% of 32, the maximum impairment value for the knee as per the *AMA Guides*. It should be noted that, while only 32 of the 50 data points (64%) satisfy that requirement when using the uncorrected FCR data, as it is traditionally determined, all data points fall into the *AMA Guides*' desired range when using the correction to FCR knee data presented in this paper.





Graphs 4a (top) and 4b (bottom): The Deviation in WPI Ratings for the Knee: *Supplemental Data*. The difference between WPI ratings—FLR – FLC—is shown for all knee cases, with the top graph showing the uncorrected data and the bottom accounting for correction to the FCR knee data presented in this paper. The dashed lines are guides for the eye, as data points that fall between them satisfy the criterion that the ratings are within 3.2 of each other, i.e., 10% of 32, the maximum impairment value for the knee as per the *AMA Guides*. It should be noted that, while only 16 of the 23 data points (69.6%) satisfy that requirement when using the uncorrected FCR data, as it is traditionally determined, all data points fall into the *AMA Guides*' desired range when using the correction to FCR knee data presented in this paper.

Discussion:

Both the traditional FCR and the FLR methods described herein are based on the *AMA Guides*, with the latter, to the knowledge of the authors, being the first published approach to evaluating impairment that focuses directly on functional loss. The FLR method has been shown to be extremely consistent with the traditional FCR method for cases where there is mild or moderate impairment for both the lumbar spine and the shoulder, but the two methods often give very different results for the knee.

It has been proposed here that the FLR provides a more accurate assessment of impairment in such cases with the knee, where the two methods give much different results, as it is believed that the FCR overstates the impairment rating in certain clinical situations, such as those involving arthritis and or surgery. A universal knee correction factor has therefore been determined that, when applied to all knee FCR values, causes the FCR and FLR values to fall within the 10% consistency threshold mandated by the *AMA Guides* in 100% of the knee cases. This, along with the 100% and 96.4% agreement between the two methods for the shoulder and lumbar spine, respectively, demonstrate the validity of the FLR method.

The FLR method has the advantage of being able to obtain a WPI much more quickly, easily, and inexpensively than with the FCR approach. The FLR method is also shown to give consistent results for the shoulder and lumbar spine, and, as demonstrated here, more accurate results for the knee. For these reasons, the FLR approach presented in this paper is proposed as a computational improvement upon the traditional FCR method.