Utilizing data analytics as a pre-emptive strategy for reducing musculoskeletal-related expenditures within an employer-sponsored health plan

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This article is a portion of a book titled "Challenges, Risks and Opportunities in Today's Spine World " edited by Stephen Hochschuler, MD, Frank Phillips, MD, and Richard Fessler, MD. You can find links to the previous chapters at the end of this article.

Introduction

It is important to understand the state of health and economics related to employer-sponsored health plans, due to the fact that over 150 million Americans are insured through employer-sponsored health insurance. Approximately 105 million Americans are provided health coverage by a self-insured employer health plan. When an employer is self-insured, this basically means that they are paying health care coverage from the first dollar spent out of their corporate budget. Employer-sponsored health care coverage is the largest employee-related expense; it accounts for 8% of an employee's total compensation according to the Bureau of Labor statistics.

Self-insured employers are essentially required to manage another business unit, which is the provision of employee health care. In order to reduce health care related spending and reduce risk among their employer-sponsored health plans, employers are becoming proactive in creating countermeasures to escalating health care costs. One of the first steps in defining manageable risk within their populations is to utilize data analytics to identify risk mitigation opportunities. Within this brief overview, we will investigate how an employer can utilize data analytics to investigate one of their most expensive cost centers: musculoskeletal-related health care utilization.

Analysis

We began our investigation by utilizing data analytics to identify the economic burden associated with musculoskeletal diagnoses. This investigation looked at a typical employer's data (i.e., medical and pharmacy claims data) over a 3-year period of time. This employer had a population of 28,957 individuals who utilized health care services. Figure 1 displays overall health care spending related to all diagnosis over a 3-year period.

Table 1:

	Amount Paid	Number of Individuals
2017	$81,233,802	28,957
2018	$83,712,044	28,728
2019 (partial year)	$62,031,051	26,256

Our next step in this analysis was to identify which diagnostic categories drove the majority of expenditures. As can be seen in Figure 2, musculoskeletal was the second most expensive diagnostic category.

Table 2:

	Diagnostic Category	Amount Paid
1.	Diseases of the Circulatory System	$6,943,549
2.	Diseases of the Musculoskeletal System	$6,401,471
3.	Diseases of the Genitourinary System	$4,080,040
4.	Neoplasms (i.e., Cancer)	$4,006,051

The next questions to be answered were: How many people had a diagnosis code related to a musculoskeletal disorder? What was the impact of co-morbidities on their overall expenditures?

This view of the data can be seen in Figure 3. This data indicates the huge prevalence of musculoskeletal-related diagnoses and the economic impact.

Table 3:

	All Individuals			Individuals with Musculoskeletal Diagnosis and combined co-morbidites		
	Total Paid	# of Individuals	Mean Amount	Total Paid	# of Individuals	Mean Amount
Total	$226,976,896	83,941	$2,704	$136,812,624	31,541	$4,338
2017	$81,233,802	28,957	$2,805	$49,005,978	10,953	$4,474
2018	$83,712,044	28,728	$2,914	$50,322,668	10,823	$4,650
2019	$62,031,051	26,256	$2,363	$37,483,977	9,765	$3,839

The investigation of musculoskeletal diagnoses continued by calculating the number of lost days associated with specific musculoskeletal diagnoses. Lost time is another economic loss related to the employer's health plan, and its burden must be added to health care expense related to treatment of the diagnosis. This impact can be seen in Figure 4.

Table 4:

	Total Lost Days	# of Individuals	Average Lost Days
2017	667,603	10,096	66
2018	665,663	10,051	66
2019	474,442	8,791	54

The next stage of analyzing the data investigated musculoskeletal diagnoses that could be potentially work-site-related or job-related. The results from this analysis can be seen in Figure 5.

Table 5:

		Total Paid	# of Individuals	Mean Amount
Hand & Wrist	2017	$23,419	45	$520
	2018	$24,269	38	$639
	2019	$37,753	28	$1,348
Upper Extremities	2017	$711,326	214	$3,324
	2018	$532,466	194	$2,745
	2019	$523,369	168	$3,115
Back	2017	$36,726	156	$235
	2018	$20,122	135	$149
	2019	$18,723	96	$195

In order to better understand the source of the spending related to musculoskeletal diagnoses, the data was arranged to quantify the most expensive diagnoses. As can be seen in Figure 6, low back pain was the most expensive musculoskeletal diagnosis.

Table 6:

Diagnosis Code	Description	Amount Paid	n
M545	Low back pain	$448,508	7,168
M1711	Unilateral primary osteoarthritis, right knee	$398,198	869
M4806	Spinal stenosis, lumbar region	$252,707	263
M1611	Unilateral primary osteoarthritis, right hip	$219,642	194
M542	Cervicalgia	$200,035	4,501
M1712	Unilateral primary osteoarthritis, left knee	$184,842	474
M5126	Other intervertebral disc displacement, lumbar region	$171,355	314
M4802	Spinal stenosis, cervical region	$143,344	203
M1612	Unilateral primary osteoarthritis, left hip	$141,824	146
M25511	Pain in right shoulder	$141,081	2,514
M5416	Radiculopathy, lumbar region	$140,088	844
M5117	Intvrt disc disorders w radiculopathy, lumbosacral region	$129,153	111
M75121	Complete rotator-cuff tear/rupture of r shoulder, not trauma	$125,381	139
M25562	Pain in left knee	$114,881	1,529
M4712	Other spondylosis with myelopathy, cervical region	$114,880	61
M0579	Rheu arthritis w rheu factor mult site w/o org/sys involv	$112,241	632
M25561	Pain in right knee	$111,686	1,602
M5116	Intervertebral disc disorders w radiculopathy, lumbar region	$107,186	232
M19012	Primary osteoarthritis, left shoulder	$103,075	130
M5136	Other intervertebral disc degeneration, lumbar region	$101,661	1,649

The frequency of musculoskeletal diagnoses was the next logical step to investigate within the data. Again, as can be seen in Figure 7, low back was identified as the most frequent musculoskeletal diagnosis related to this particular employer's data set.

Table 7:

Top 20 Most Frequent Diagnoses for Individuals with Musculoskeletal Diagnosis

2017

Diagnosis Code	Description	Amount Paid	Frequency	n
M545	Low back pain	$448,508	7,168	1,156
M542	Cervicalgia	$200,035	4,501	602
M9901	Segmental and somatic dysfunction of cervical region	$61,161	2,607	222
M25511	Pain in right shoulder	$141,081	2,514	317
M9903	Segmental and somatic dysfunction of lumbar region	$33,335	1,913	201
M5136	Other intervertebral disc degeneration, lumbar region	$101,661	1,649	264
M25561	Pain in right knee	$111,686	1,602	342
M25562	Pain in left knee	$114,881	1,529	293
M25512	Pain in left shoulder	$99,690	1,484	253
M546	Pain in thoracic spine	$61,320	1,135	177
M1711	Unilateral primary osteoarthritis, right knee	$398,198	869	138
M5412	Radiculopathy, cervical region	$83,125	868	156
M5416	Radiculopathy, lumbar region	$140,088	844	205
M5441	Lumbago with sciatica, right side	$28,752	820	92
M9902	Segmental and somatic dysfunction of thoracic region	$17,536	803	95
M791	Myalgia	$32,036	718	140
M2550	Pain in unspecified joint	$19,171	713	114
M5442	Lumbago with sciatica, left side	$29,098	690	89
M79671	Pain in right foot	$25,170	645	203
M549	Dorsalgia, unspecified	$46,949	636	199

The investigation of the employer's data set related to musculoskeletal diagnoses continued by identifying the most expensive procedures related to the treatment of musculoskeletal disorders. As can be seen in Figure 8, physical therapy was related to one of the most expensive procedures. The logical next question would be to investigate the outcomes related to physical therapy and determine which patient's condition exacerbated into a necessary surgery or more expensive expenditure.

Table 8:

Top 20 Most Expensive Procedures for Individuals with Musculoskeletal Diagnosis

2017

CPT Code	Description	Amount Paid	n
97110	Therapeutic exercise to develop strength, endurance, range of motion, and flexibility, each 15 minutes	$287,327	552
99213	Established patient office or other outpatient visit, typically 15 minutes	$207,641	2,493
99214	Established patient office or other outpatient, visit typically 25 minutes	$207,424	1,567
98941	Chiropractic manipulative treatment, 3 to 4 spinal regions	$135,244	693
63030	Partial removal of bone with release of spinal cord or spinal nerves of 1 interspace in lower spine	$133,560	18
J1745	INFLIXIMAB NOT BIOSIMIL 10MG	$94,778	6
99203	New patient office or other outpatient visit, typically 30 minutes	$82,561	972
29881	Removal of one knee cartilage using an endoscope	$72,243	31
97140	Manual (physical) therapy techniques to 1 or more regions, each 15 minutes	$67,616	275
72148	MRI scan of lower spinal canal	$65,731	263
63047	Partial removal of middle spine bone with release of spinal cord and/or nerves	$62,992	17
J9310	RITUXIMAB INJECTION	$60,666	3
J1602	GOLIMUMAB FOR IV USE 1MG	$56,668	2
22551	Fusion of spine bones with removal of disc at upper spinal column, anterior approach	$56,363	21
29827	Repair of shoulder rotator cuff using an endoscope	$55,936	15
29824	Partial removal of collar bone at shoulder using an endoscope	$54,977	17
64493	Injections of lower or sacral spine facet joint using imaging guidance	$54,673	40
27447	Repair of knee joint	$53,873	23
29826	Shaving of shoulder bone using an endoscope	$50,523	25
64483	Injections of anesthetic and/or steroid drug into lower or sacral spine nerve root using imaging guidance	$48,042	48

Conclusion

The results from this analysis demonstrate a logical progression of data interrogation that employers can utilize to better understand the underlying causes of their musculoskeletal expenditures. In order to capitalize on the learnings from the aforesaid analysis, employers should consider the following strategies:
• Establish early warning indicators within the data in order to act in a timely manner, (ex: diagnosis of low back pain, order for nuclear imaging of the spine, etc.). And consider the use of predictive modeling to identify risk promptly, in order to maximize treatment option.
• In partnership with a physician, establish clinical criteria to best triage and treat various musculoskeletal diagnosis, (i.e., evidence-based rules).
• Investigate outcomes based alternative treatment protocols for various musculoskeletal diagnosis
• Consider implementing various therapeutic lifestyle changes at the worksite, (i.e., exercise, nutrition, etc.). This helps to mitigate pre-cursors to musculoskeletal conditions by reducing risk factors that cause or exacerbate musculoskeletal conditions, (ex: obesity, inactivity, poor muscle strength & endurance, etc.).