



The University of Texas at Austin
Dell Medical School

Population Health Management
Lessons from Workers' Compensation

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December 2, 2016

Austin Business Group on Health

Labor Costs

Salary and Supplemental Pay	74%
Paid Leave	7%
Health Insurance	8 - 9%
Retirement and Savings	4%
Workers' Compensation	1 - 2%
Other (replacement labor)	7%
	<hr/> <hr/>
	100%

Labor intensive versus capital intensive industry

Source Bureau of Labor Statistics, 2014

Standardized Mortality Ratios and Observed Number of Deaths () from All Causes, by Period of Follow-up

Period of Follow-up (years)*	Atomic Energy	Canadian Labor Force	Eldorado Resources
	Males	Males	Males
0-4	54.1 (61)	74.4 (7,765)	129.9 (106)
5-9	58.7 (84)	85.4 (14,573)	102.9 (96)
10-14	82.9 (140)	108.2 (18,856)	101.7 (116)
15-19	85.3 (157)		107.6 (132)
20-24	95.4 (187)		97.3 (114)
25+	96.6 (253)		73.3 (39)
Total	82.7 (882)	90.7 (41,194)	103.6 (603)

*Time since first employment, 1950 to 1981

Source: Am J of Epid, Vol:128:6:1364-1375, 1988

Standardized Mortality Ratios and Observed Number of Deaths from all Causes, by Period of Follow-Up and by Continuing Employment in the Atomic Energy of Canada Limited Cohort (males only)

Period Of F/U (yrs)*	Currently Employed	No Longer Employed
0-9	59.6 (52)	55.1(93)
10-19	61.3 (48)	90.7 (249)
>20	62.9 (36)	100.8 (404)
Total	61.0 (136)	88.4 (746)

* Time since first employment

Source: Am J of Epid, Vol:128:6:1364-1375, 1988

Mechanisms to Contain Medical Care Expenditures

- Place applicants in jobs they are capable of performing and provide a safe workplace
- Manage the medical care of injured workers
- Provide programs aimed at preventing or delaying the onset of non-occupational illness or impairment
- Design a medical benefit plan that incentivizes employees/dependents to obtain medical care while conditions are reversible or treatable

Workers' Compensation and Opt-Out Arrangements

- Workers Compensation was the first social insurance scheme
 - Germany 1884
 - US 1890s
 - Texas 1913
- No fault system: paying all medical care and salary replacement (3/4 tax-free paid wage)
- No deductibles or copayments
- A claim is the entire episode of medical care and disability payments through closure (lifetime)

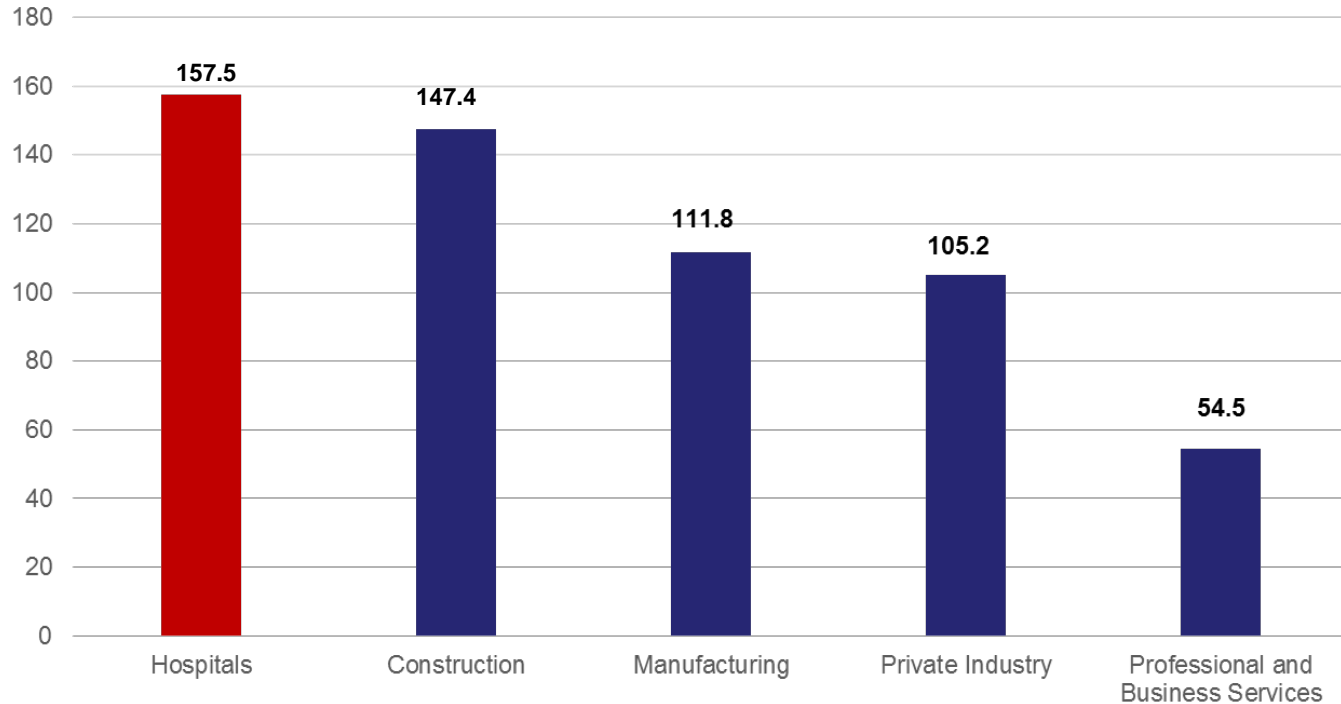
Workers' Compensation and Opt-Out Arrangements

- In Texas, 25% of employees are covered by “opt-out” injury insurance schemes
- In most states (except TX, OK), WC is compulsory
- Free choice of medical provider
- Texas employers may participate (and receive discounts) in a Certified Workers' Compensation Health Care Network which permit choice of medical providers by injured workers (2005)

Because of the “Tail” in Workers’ Compensation, Early and Continuous Management is Critical – JHH Claims

Year Of Payment	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	Totals
92/93	\$ 168,886											\$ 168,886
93/94	\$ 206,414	\$ 249,813										\$ 456,227
94/95	\$ 190,928	\$ 325,624	\$ 134,017									\$ 650,569
95/96	\$ 105,247	\$ 193,791	\$ 287,421	\$ 185,909								\$ 772,368
96/97	\$ 37,577	\$ 120,797	\$ 160,334	\$ 351,924	\$ 137,396							\$ 808,028
97/98	\$ 27,594	\$ 150,622	\$ 69,737	\$ 159,029	\$ 233,951	\$ 276,265						\$ 917,198
98/99	\$ 14,814	\$ 42,434	\$ 33,796	\$ 127,277	\$ 247,159	\$ 362,882	\$ 188,885					\$ 1,017,247
99/00	\$ 17,034	\$ 94,155	\$ 43,848	\$ 99,487	\$ 112,856	\$ 308,532	\$ 375,110	\$ 251,701				\$ 1,302,723
00/01	\$ 35,760	\$ 23,370	\$ 16,924	\$ 37,193	\$ 48,235	\$ 157,250	\$ 652,744	\$ 446,280	\$ 294,101			\$ 1,711,857
01/02	\$ 10,351	\$ 3,921	\$ 31,873	\$ 22,563	\$ 18,793	\$ 101,260	\$ 357,287	\$ 333,628	\$ 391,117	\$ 267,091		\$ 1,537,884
02/03	\$ 785	\$ 39,686	\$ 6,372	\$ 20,572	\$ 42,797	\$ 85,153	\$ 288,890	\$ 258,846	\$ 128,148	\$ 303,824	\$ 219,978	\$ 1,395,051
03/04	\$ 3,842	\$ 27,309	\$ 5,232	\$ 57,448	\$ 20,989	\$ 188,990	\$ 424,635	\$ 200,409	\$ 219,047	\$ 268,214	\$ 376,245	\$ 1,792,360
04/05	\$ 3,973	\$ 32,192	\$ 5,722	\$ 41,592	\$ 12,189	\$ 64,102	\$ 341,062	\$ 181,789	\$ 203,347	\$ 247,145	\$ 227,790	\$ 1,360,903
05/06	\$ 6,907	\$ 2,413	\$ 7,515	\$ 33,704	\$ 10,731	\$ 59,847	\$ 248,250	\$ 197,848	\$ 52,122	\$ 134,289	\$ 240,256	\$ 993,882
06/07	\$ 18,814	\$ 19,859	\$ 9,163	\$ 10,726	\$ 7,060	\$ 53,122	\$ 292,119	\$ 104,606	\$ 15,403	\$ 122,197	\$ 73,533	\$ 726,602
07/08	\$ 903	\$ 9,806	\$ 5,119	\$ 3,671	\$ 3,261	\$ 21,030	\$ 342,526	\$ 109,866	\$ 11,868	\$ 102,757	\$ 92,382	\$ 703,189
08/09	\$ -	\$ 44,608	\$ 4,629	\$ 346	\$ 10,426	\$ 14,955	\$ 213,982	\$ 78,965	\$ 46,603	\$ 162,634	\$ 16,584	\$ 593,732
09/10	\$ -	\$ 51,390	\$ 1,988	\$ 81,773	\$ 9,041	\$ 22,176	\$ 210,424	\$ 37,904	\$ 387	\$ 14,886	\$ 35,466	\$ 465,435
10/11	\$ -	\$ 24,667	\$ 1,319	\$ 71,291	\$ 14,041	\$ 20,371	\$ 144,623	\$ 37,188	\$ -	\$ 6,557	\$ 32,098	\$ 352,154
11/12	\$ -	\$ 11,089	\$ 641	\$ 24,713	\$ 26,891	\$ 15,749	\$ 120,654	\$ 75,104		\$ 19,418	\$ 13,928	\$ 308,187
12/13	\$ -	\$ 14,524	\$ 939	\$ 20,431	\$ 2,454	\$ 7,849	\$ 134,710	\$ 57,601	\$ 66,236	\$ 126,017	\$ 7,768	\$ 438,529
13/14	\$ -	\$ 12,973	\$ 783	\$ 14,864	\$ -	\$ 6,775	\$ 137,469	\$ 72,079	\$ 95	\$ 58,318	\$ 6,976	\$ 310,333
14/15	\$ -	\$ 8,428	\$ 649	\$ 54,461	\$ -	\$ 333	\$ 106,792	\$ 65,753	\$ -	\$ 36,803	\$ 233	\$ 273,452
Total	\$ 849,829	\$ 1,503,471	\$ 828,022	\$ 1,418,973	\$ 958,271	\$ 1,766,641	\$ 4,580,161	\$ 2,509,568	\$ 1,428,474	\$ 1,870,150	\$ 1,343,237	\$ 19,056,795

Rate of Injuries and Illnesses Resulting in Days Away from Work, 2012 (per 10,000 FTW)



Source Bureau of Labor Statistics, June 2015

The Key to Reducing the Number of Injuries and Decreasing Workers' Compensation Costs is to:

1. Improve Safety
2. Engage Employees
3. Begin treatment At The Earliest Possible Time After The Injury
4. Continuously Manage Medical Care Through Return To Work

Organization Matters

- **Prevention:** safety/loss control
- **Treatment:** on-site clinic and provider network
- **Risk:** self-insured with stop loss or insured
- **Administration:** claims payment and adjudication (self administered vs third party administration)

Scenarios

1. Prevention, treatment, risk and claims administration integrated.
2. Prevention, treatment, risk and claims administration not integrated.

Scenario 1

Integrated System

Optimal Workers' Compensation Medical/Claims Management

Immediate assessment if the injury

Diagnosis, treatment and follow-up performed at convenient site by engaged medical providers

Referrals to skilled specialists with knowledge of the workers' compensation system

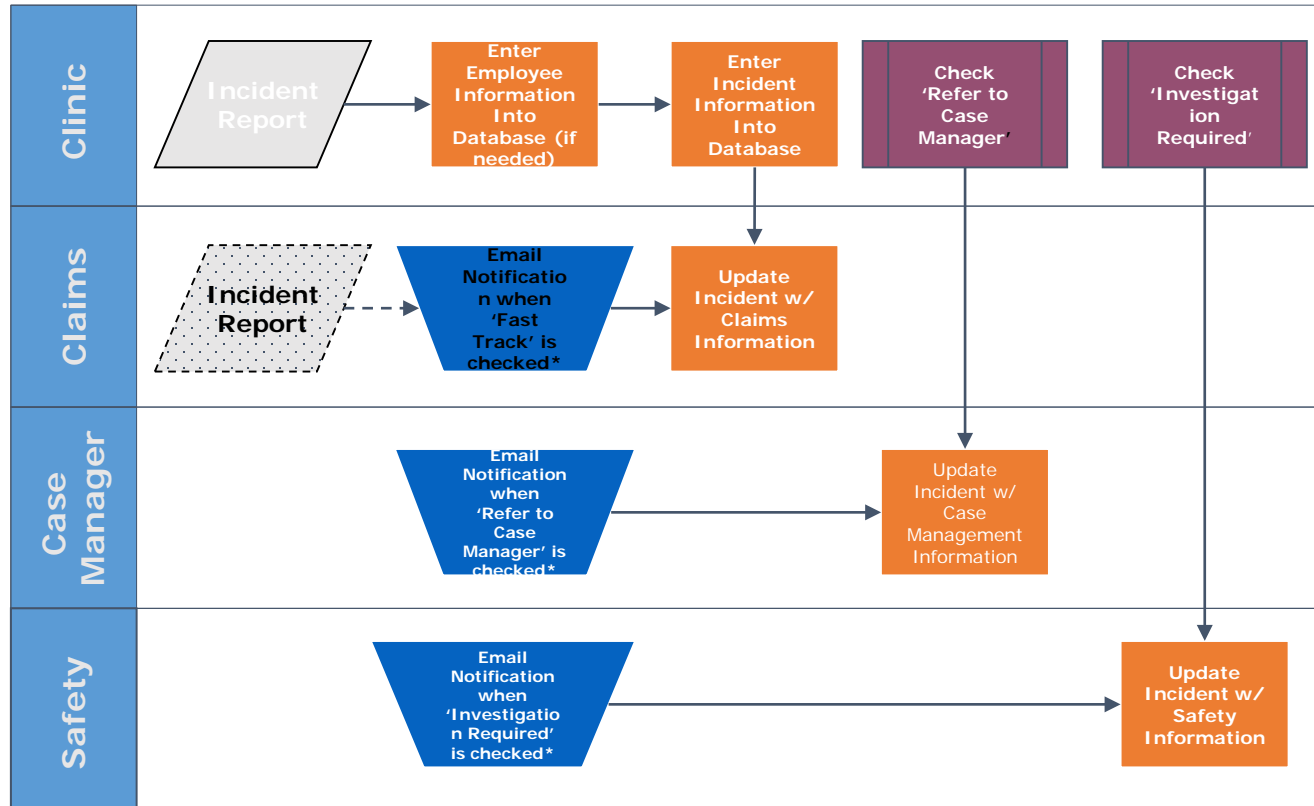
Nurse case manager (NCM) facilitates the diagnostic and treatment process or constrains inappropriate care

Continuous, close management of injury and comorbidities to assure early return to work and appropriateness of medical care

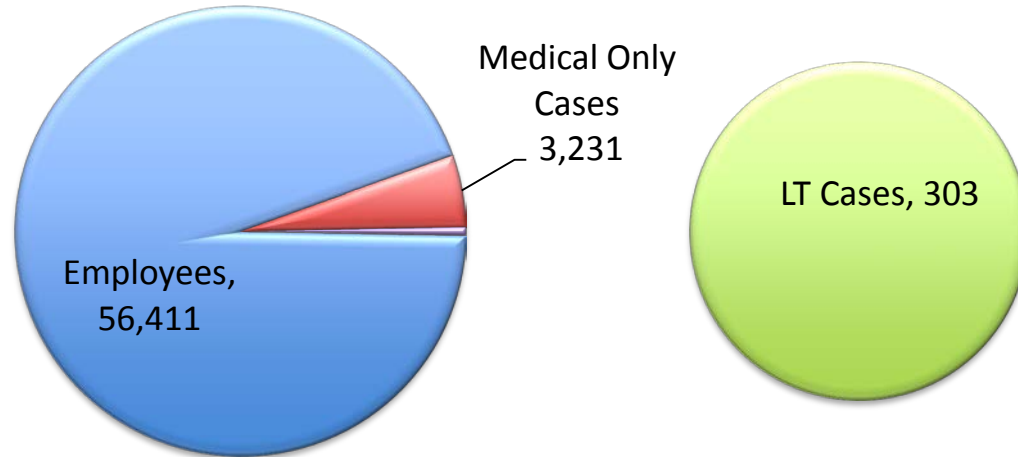
Information transfer between all parties – safety, medical, claims, supervisors – regarding status of injured employee

Performance metrics shared with all parties quarterly

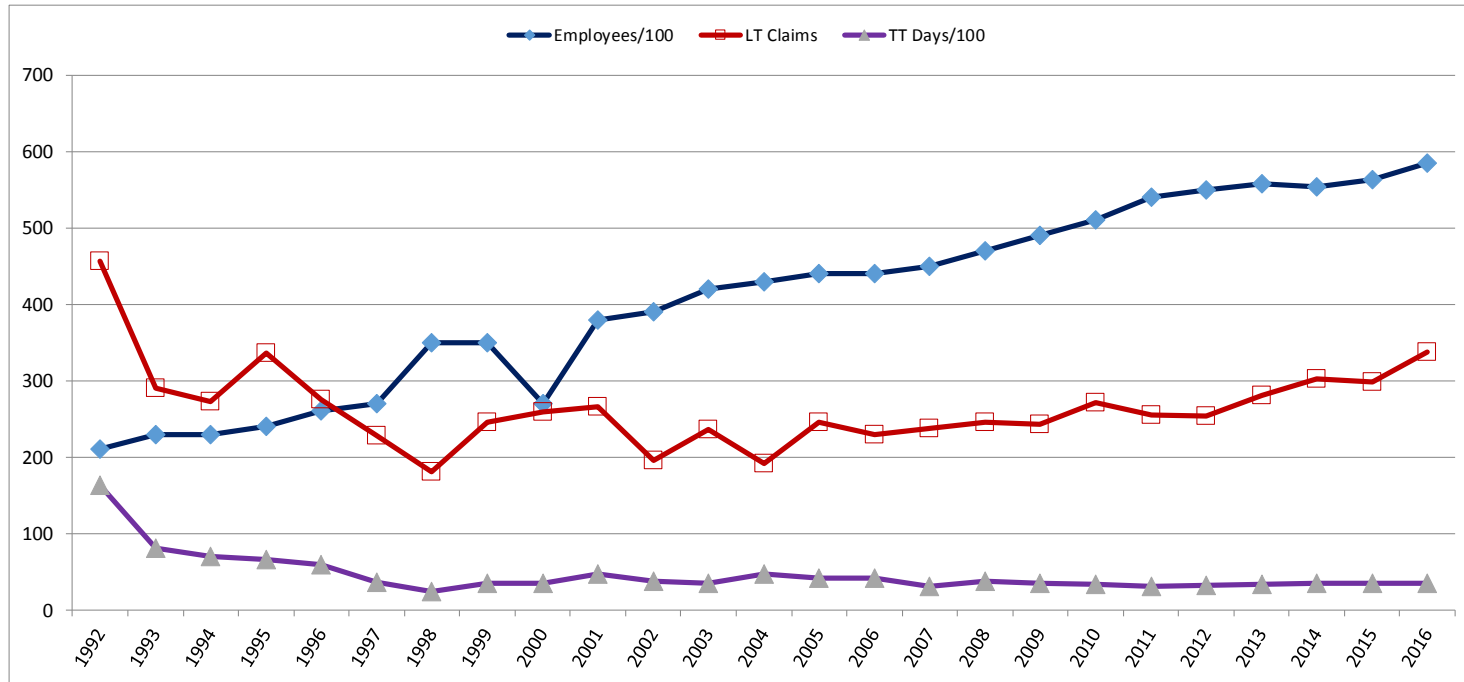
Integrated Claims Management System Workflow



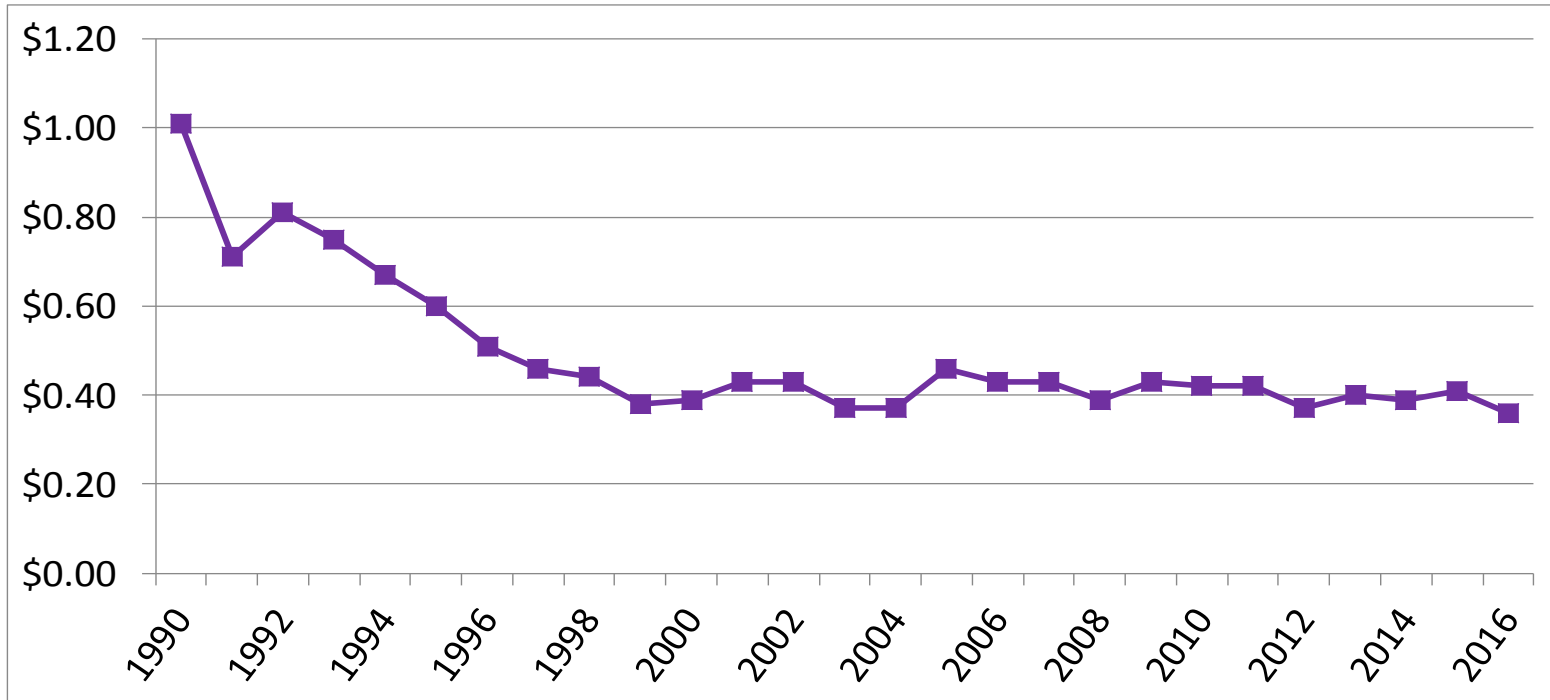
Population FY 2016



Number of Employees, Lost Time Claims, and Temporary Total Days Lost Per 100 Employees FY 1992 – 2016

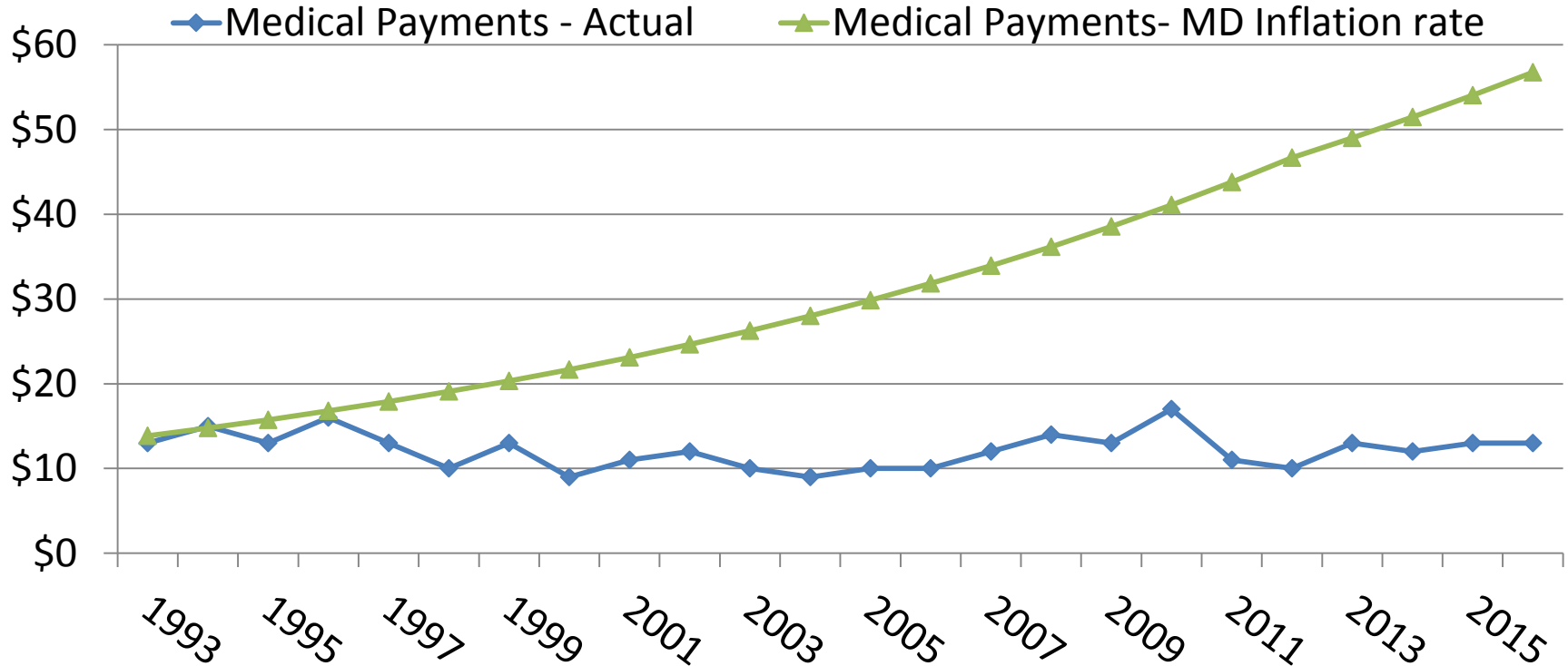


Workers' Compensation and Medical, Indemnity and Administrative Costs Per \$100 of Covered Wages, 1990-2016 JHH/JHU

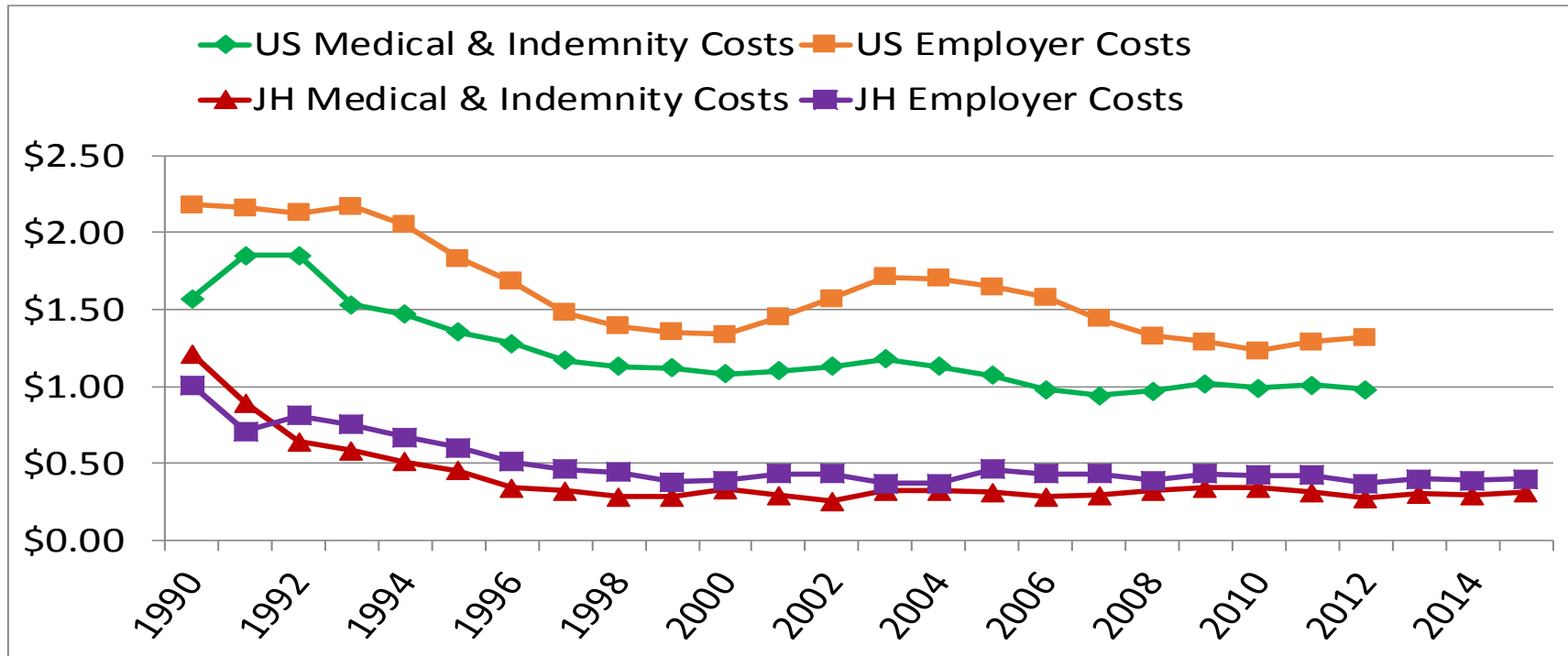


Johns Hopkins Workers Compensation Program

Per Capita WC Medical Payments (Year of Injury) by Fiscal Year



Workers' Compensation Benefits (Losses) and Employee Costs Per \$100 of Covered Wages, 1990-2016



Methodology

Open and closed indemnity claims for each accident year followed for ten years

JHM Number of claims by Accident and Closed Year, Indemnity Claims, Health System excluding Broadway Services Inc.

Accident Year											All Closed	Still Open	% Closed	All Claims
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012				
2003	17	71	20	25	12	11	3	3	11	5	178	1	99.44%	179
2004		29	59	44	20	20	9	6	8	4	199	2	99.00%	201
2005			32	90	51	24	11	9	11	10	238	6	97.54%	244
2006				42	95	41	30	15	10	7	240	7	97.17%	247
2007					39	98	31	36	15	15	234	26	90.00%	260
2008						30	93	68	35	11	237	28	89.43%	265
2009							29	112	39	20	200	32	86.21%	232
2010								34	97	61	192	44	81.36%	236
2011									38	83	121	102	54.26%	223
2012										43	43	192	18.30%	235
Total	17	100	111	201	217	224	206	283	264	259	1882	440	81.05%	2322

Hospital X Number of Claims by Accident and Closed Year, Indemnity Claims

Accident Year											All Closed	Still Open	% Closed	All Claims
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012				
2003	2	42	60	24	4	8	4	6	6	2	158	11	93.49%	169
2004		4	92	63	3	21	16	6	13	6	224	9	96.14%	233
2005			27	95	17	22	21	16	9	11	218	34	86.51%	252
2006				54	63	39	38	21	15	13	243	20	92.40%	263
2007					14	70	35	28	23	17	187	38	83.11%	225
2008						26	82	60	39	31	238	44	84.40%	282
2009							20	70	45	42	177	48	78.67%	225
2010								21	58	57	136	80	62.96%	216
2011									7	49	56	120	31.82%	176
2012										13	13	195	6.25%	208
Total	2	46	179	236	101	186	216	228	215	241	1650	599	73.37%	2249

JHM Average Total Paid by Claim Age

Accident Year	Closed by Claim Age Year									All Closed	Total Cost for Closed	Still Open	Total Cost for Open	All Claims	Total Cost	
	0	1	2	3	4	5	6	7	8							9
2003	\$850	\$3,479	\$8,743	\$15,852	\$15,630	\$34,687	\$44,282	\$111,166	\$49,962	\$67,241	\$15,471	\$2,753,847	\$52,885	\$52,885	\$15,680	\$2,806,733
2004	\$1,672	\$5,026	\$16,901	\$18,659	\$53,767	\$35,410	\$25,729	\$23,260	\$139,763		\$18,871	\$3,755,362	\$194,602	\$389,204	\$20,620	\$4,144,565
2005	\$1,015	\$3,195	\$14,118	\$15,234	\$31,500	\$24,659	\$44,019	\$70,617			\$13,296	\$3,164,509	\$79,205	\$475,233	\$14,917	\$3,639,742
2006	\$1,473	\$4,323	\$13,052	\$23,056	\$18,557	\$64,556	\$66,327				\$12,865	\$3,087,564	\$113,033	\$791,231	\$15,704	\$3,878,795
2007	\$1,645	\$5,173	\$11,436	\$18,983	\$49,598	\$31,682					\$12,086	\$2,828,215	\$84,813	\$2,205,125	\$19,359	\$5,033,341
2008	\$1,876	\$8,371	\$7,924	\$22,002	\$41,484						\$10,970	\$2,599,946	\$92,915	\$2,601,611	\$19,629	\$5,201,557
2009	\$2,533	\$6,713	\$11,202	\$16,709							\$7,982	\$1,596,339	\$68,150	\$2,180,792	\$16,281	\$3,777,131
2010	\$1,668	\$6,265	\$14,456								\$8,053	\$1,546,187	\$29,430	\$1,294,907	\$12,039	\$2,841,094
2011	\$2,689	\$4,643									\$4,029	\$487,541	\$21,551	\$2,198,172	\$12,044	\$2,685,712
2012	\$1,884										\$1,884	\$81,030	\$6,049	\$1,161,485	\$5,287	\$1,242,515
Grand Total	\$1,775	\$5,353	\$12,354	\$19,023	\$36,763	\$37,833	\$45,767	\$58,369	\$73,909	\$67,241	\$11,637	\$21,900,541	\$30,342	\$13,350,644	\$15,181	\$35,251,185

Hospital X Average Total Paid by Claim Age

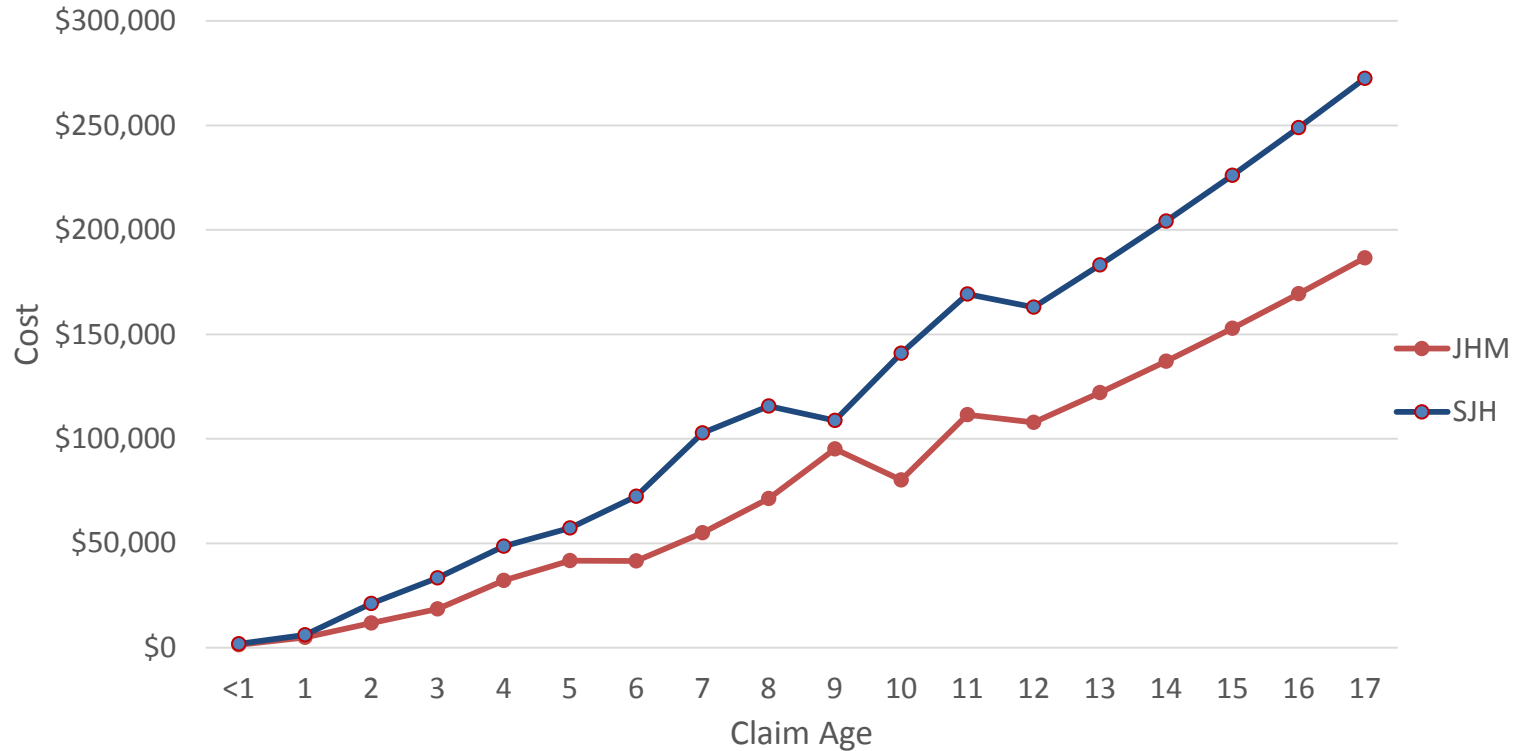
Accident Year	Closed Year										All Closed	Total Cost for Closed	Still Open	Total Cost for Open	All Claims	Total Cost
	0	1	2	3	4	5	6	7	8	9						
2003	\$1,131	\$10,342	\$8,810	\$16,365	\$27,475	\$60,585	\$30,995	\$45,206	\$41,462	\$30,858	\$16,824	\$2,658,253	\$210,301	\$2,313,313	\$29,418	\$4,971,565
2004	\$898	\$8,041	\$7,215	\$16,165	\$32,013	\$37,402	\$30,434	\$43,367	\$65,643		\$16,327	\$3,657,319	\$114,555	\$1,030,993	\$20,122	\$4,688,312
2005	\$1,831	\$5,658	\$11,966	\$27,770	\$21,992	\$41,814	\$46,595	\$57,266			\$16,428	\$3,581,412	\$170,118	\$5,784,023	\$37,164	\$9,365,435
2006	\$2,134	\$8,043	\$14,580	\$14,985	\$37,097	\$27,079	\$64,308				\$15,560	\$3,781,189	\$156,056	\$3,121,130	\$26,245	\$6,902,318
2007	\$2,397	\$5,914	\$21,548	\$20,439	\$24,197	\$50,060					\$17,014	\$3,181,561	\$116,311	\$4,419,824	\$33,784	\$7,601,385
2008	\$2,479	\$15,519	\$13,010	\$19,914	\$31,464						\$16,259	\$3,869,686	\$131,547	\$5,788,074	\$34,247	\$9,657,760
2009	\$32,001	\$11,804	\$18,841	\$22,465							\$18,405	\$3,257,680	\$70,009	\$3,360,419	\$29,414	\$6,618,099
2010	\$12,839	\$10,392	\$16,759								\$13,438	\$1,827,619	\$70,302	\$5,624,121	\$34,499	\$7,451,740
2011	\$6,101	\$8,519									\$8,216	\$460,123	\$40,939	\$4,912,622	\$30,527	\$5,372,745
2012	\$46,851										\$46,851	\$609,069	\$26,351	\$5,138,417	\$27,632	\$5,747,487
Grand Total	\$9,734	\$9,261	\$13,545	\$19,970	\$29,380	\$41,796	\$48,811	\$48,831	\$53,552	\$30,858	\$16,293	\$26,883,910	\$69,270	\$41,492,935	\$30,403	\$68,376,845

Summary: 2003-2012 Loss Experience

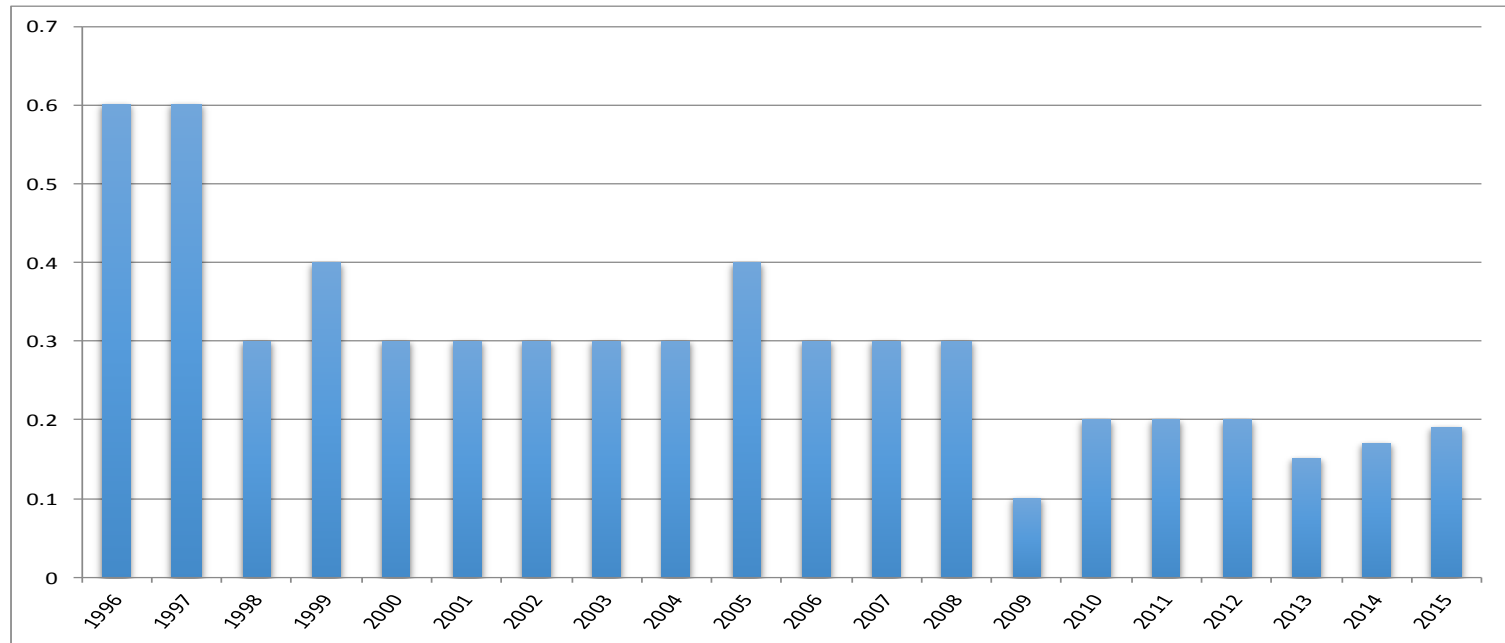
JHHS, Hospital Y, Hospital X

Variable	JHHS	Hosp. Y	Hosp. X
Number of Employees	23,500	17,500	23,000
Number of LT Claims	2,322	5,359	2,249
Total Paid	\$35 M	\$97 M	\$68 M
Average Total Paid			
Claims Still Open	\$34 K	\$68 K	\$69 K
Closed Claims	\$12 K	\$18 K	\$16 K
Open and Closed Claims	\$16 K	\$24 K	\$30 K
TPA & Excess Insurance Costs	\$3 M	\$5 M	--

Average Cumulative Closing Cost By Claim Age



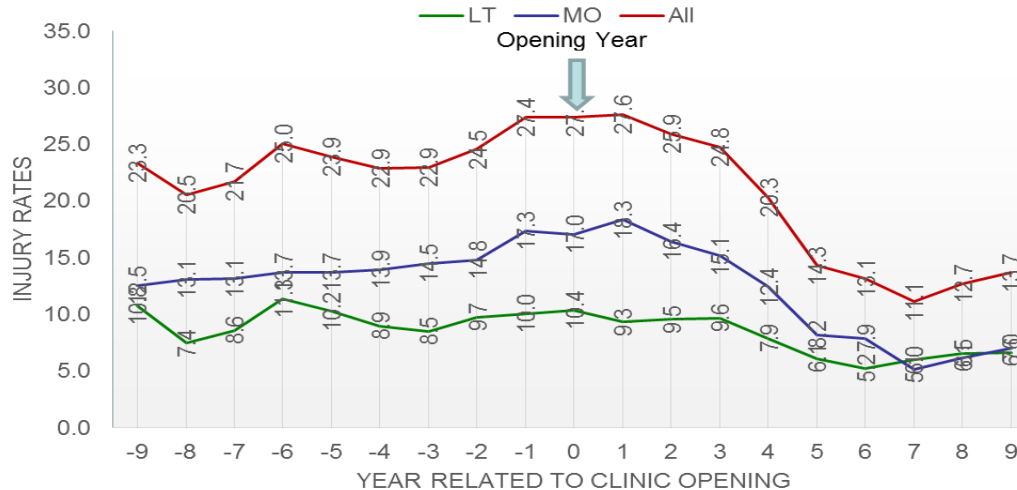
Litigation Rate (Hearings per 100 Employees)



Scenario II

Prevention, Treatment, Risk and
Administration Organizationally Separate
With On-Site Clinic

MO and LT WC Rate per 100 Employees



Observation

1. Overall WC rates decrease approximately 50% after onsite clinic established.
2. Medical only WC rates decrease approximately 66% after onsite clinic established.
3. Lost time WC rates decrease approximately 40% after onsite clinic established

Scenario III

Prevention, Treatment, Risk and
Administration Organizationally Separate
Safety/Clinical/Risk/Administration

Tools to Assist in Claims Management for Risk Bearers

- Predictive modeling
- Inventory Analysis
- Provider Networks
- Identification of cost-intensive providers

Workers' Compensation Cost Prediction and Inventory Management System

Example: 1999-2002 “Migratory” Claims followed to End of 2009

# Claims	% Claims	Total Cost	% Cost	Cost	Ratio
31,480	98.30%	\$85,071,316	43.10%	\$2,702	1
556	1.70%	\$112,467,638	56.90%	\$202,280	74.85
32,036	100.00%	\$197,538,954	100.00%	\$6,166	

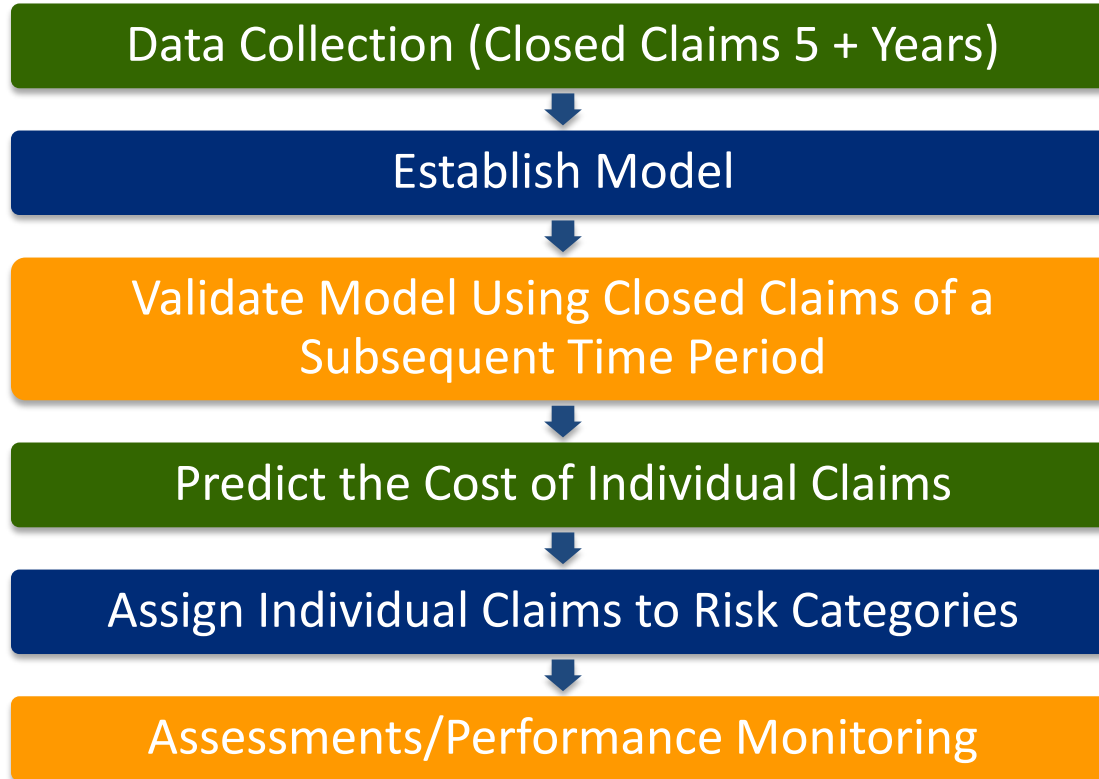
Risk Categories for Monitoring Purpose – More Useful than Actual \$ Amount Prediction

- Minor: initial reserve $< \$15,000$ and final cost $< \$100,000$
- Adverse surprise or migratory: initial reserve $\leq \$15,000$ and final cost $\geq \$100,000$
- False Catastrophic: initial reserve $\geq \$15,000$ and final cost $< \$100,000$
- True Catastrophic: initial reserve $\geq \$15,000$ and final cost $\geq \$100,000$

A Simple Prediction Model Example: Odds Ratio for Cost Migrating to >\$100,000

Variables	OR	95% CI		p
Male	1.78	1.39	2.26	<.0001
Attorney Involvement	252.12	102.75	618.61	<.0001
SA only vs. Never Opioid	6.51	4.64	9.12	<.0001
Ever LA vs. Never Opioid	10.72	6.78	16.95	<.0001
Ever Lumbar Sugery	2.57	1.72	3.85	<.0001
Ever LA after First Lumbar Surgery	2.57	1.31	5.02	0.006
Ever Hypnotics	3.11	2.34	4.14	<.0001
Ever Antipsychotics	3.19	1.47	6.93	0.0034
Ever Anti-anxiety Agents	1.52	1.16	1.99	0.0024
Ever Antidepressants	2.29	1.76	2.98	<.0001

Process Summary



Accuracy of the Categorical Prediction

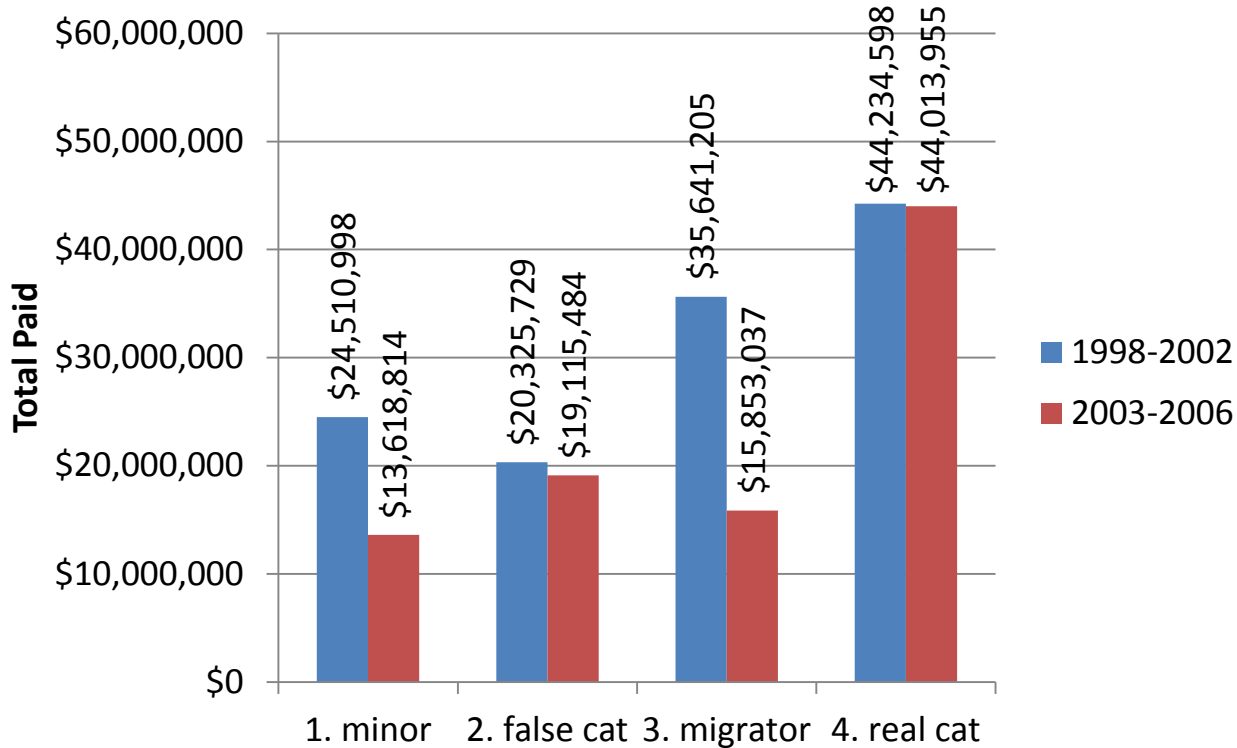
- The model is accurate and specific
- Accuracy of predicting a high cost claim ($\geq \$100,000$) = 94.5% (2,042/2,161)
- Accuracy of predicting a low cost claim ($< \$100,000$) = 93.9% (27,133/28,901)



Impact of Intervention on per Year Basis

Variables	1999-2002	2003-2006	Ratio 2003-06 vs. 1999-2002
Total Premium	\$689,219,132	\$840,483,974	1.22
Premium per Injury Year	\$172,304,782.95	\$210,120,994	1.22
Claims Per Year	9,256	6,378	0.69
Claims Per Million Premium per Year	54	30	0.57
Minor Claims per Year	7,884	5,008	0.64
False Cat Claims per Year	1,047	1,117	1.07
Migratory Claims per Year	153	76	0.50
Real Cat Claims per Year	171	177	1.04
Cost per Claim	\$11,972	\$14,519	1.21
Cost Per Injury Year	\$110,805,467	\$92,601,289	0.84

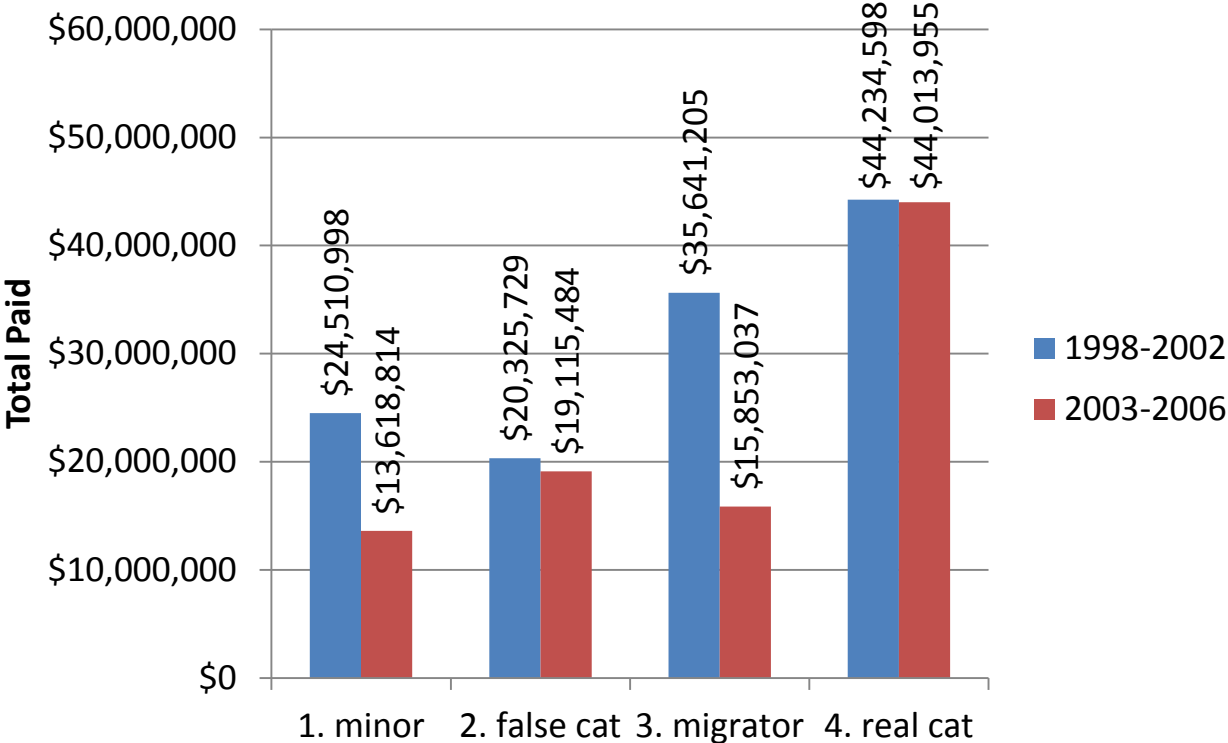
Inflation Adjusted Total Paid per Year by Risk Group



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Inflation Adjusted Total Paid per Year by Risk Group



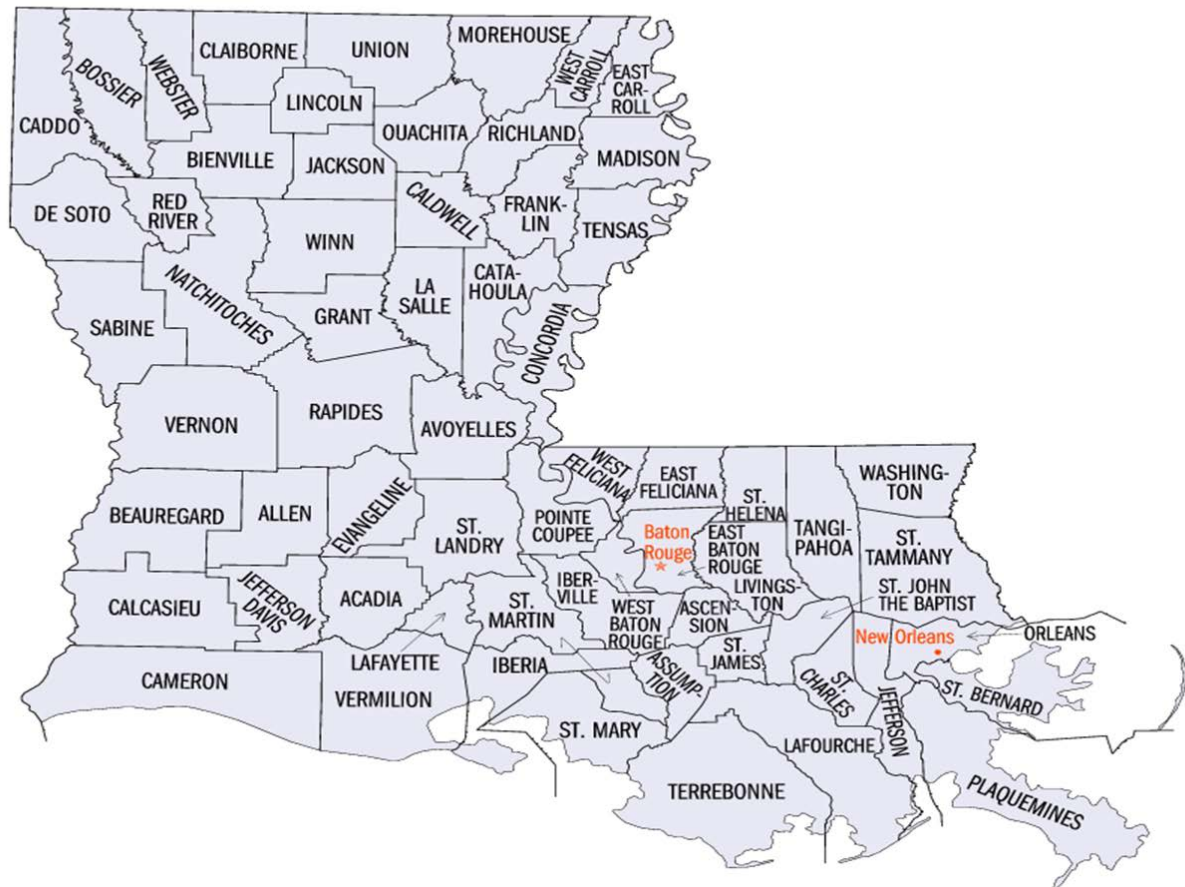
LWCC Omnet Gold (OG) Goal

Louisiana Workers' Compensation Corporation's goal in creating Omnet Gold (OG) was to permit health care providers to use the appropriate diagnostic and treatment regimens at the time they are indicated.

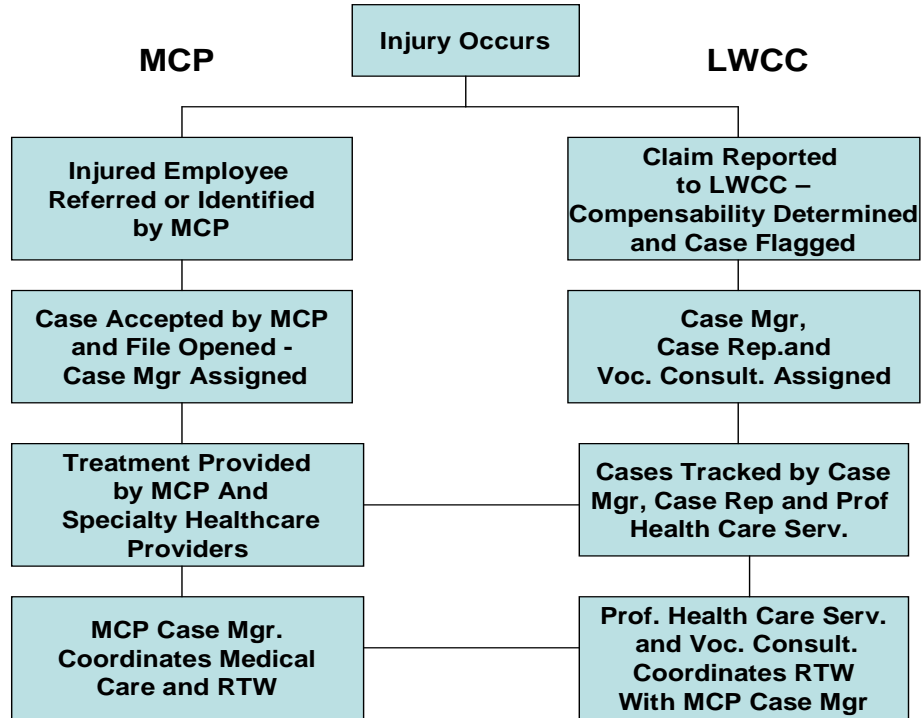
“Quality medical management aggressively applied by empowered, yet, accountable physicians trained and disciplined in common occupational care management methods and unencumbered by precertification requirements, will minimize cost and disability.”

LWCC Omnet Gold (OG) Design

- Managing Care Physician (MCPs) make up the core of OG
 - Initial treatment
 - Track medical care
- MCPs are occupational medicine practitioners
- Supporting healthcare providers are orthopedic surgeons, neurosurgeons, physiatrists, chiropractors, and physical therapists.



Omnet Gold Claims Processing

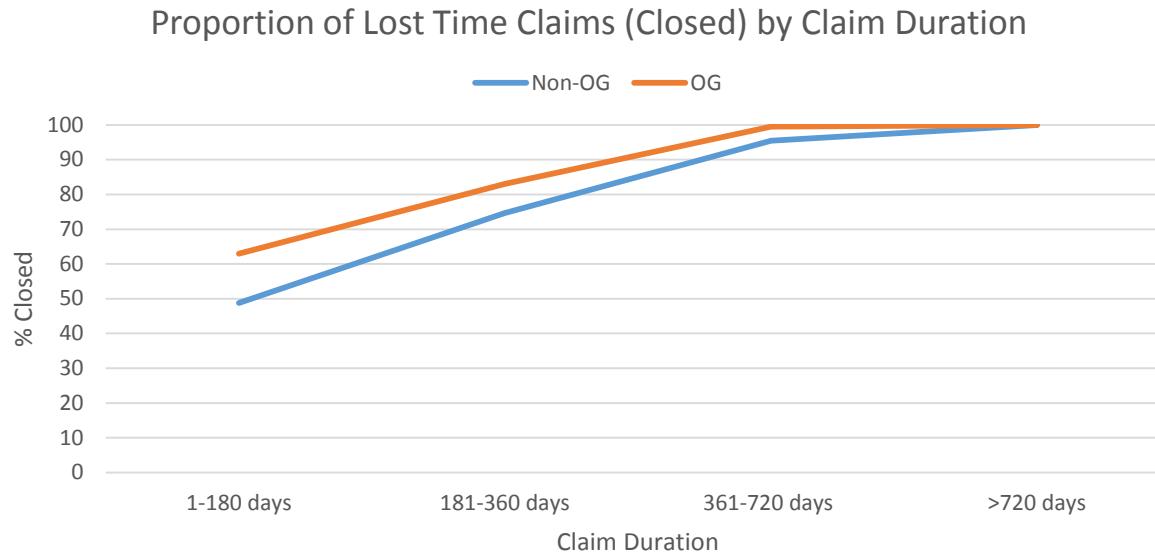


Lost Time Days, Medical, Indemnity and Other Costs: OG vs Non-OG by Claim Status

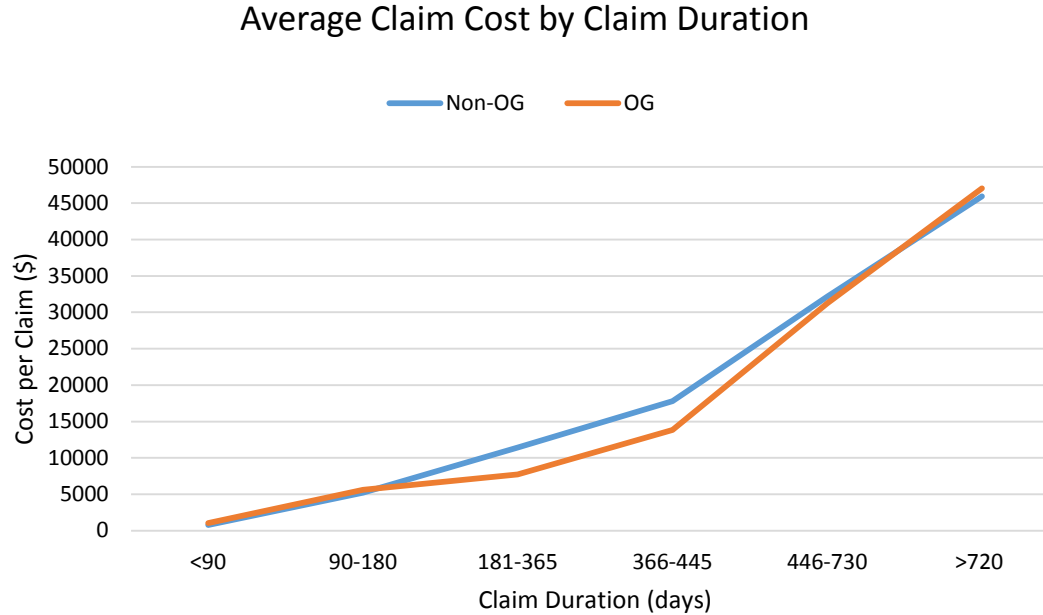
Closed Claims							
Indicators	Non-OG (1139)		OG (143)		Diff.		% Diff.
	Mean	C.I.*	Mean	C.I.*	p-value	Mean	Mean
LT Days	99	92-107	53	32-75	<.0001	46	45%
Medical Costs (\$)	9,850	9,130-10,569	5,855	3,825-7,886	0.0003	3,995	41%
Indemnity Costs (\$)	7,881	7,231-8,530	4,864	3,032-6,696	0.0024	3,017	38%
Other Costs (\$)	2,669	2,138-3,201	1,834	335-3,333	0.3031	835	31%
Total Costs (\$)	20,400	18,834-21,966	12,554	8,135-16,972	0.0011	7,846	38%

* 95% C.I.: (i.e., 95% confidence intervals of means)

Proportion of Lost Time Claims (Closed) by Claim Duration



Average Claim Cost by Claim Duration



Take Aways

- Management of workers' compensation in a labor intensive business, such as hospitals, has a large impact on operating margins and productivity.
- Prompt diagnosis, treatment and early return-to-work is the primary driver of decreased costs over time.
- When bearing significant risk over a prolonged time period, close and continuous follow up is essential to managing the cost of care for work related conditions (and perhaps chronic illnesses).

Take Aways, Part 2

- The use of Nurse Practitioners and Physician Assistants increases the ability to monitor the patient closely, improving treatment adherence and reducing costs.
- Information that will predict outcomes on a claim level is useful in planning a case management strategy.
- Advanced Practice Nurses managing injured workers can also manage disability absence for non-work related conditions (HRMS).

Related Publications - 1

- Bernacki EJ, Tao XG, Yuspeh L. A preliminary investigation of the effects of a provider network on costs and lost-time in workers' compensation. *J Occup Environ Med.* Jan 2005;47(1):3-10.
- Bernacki EJ, Tao XG, Yuspeh L. An investigation of the effects of a healthcare provider network on costs and lost time in workers' compensation. *J Occup Environ Med.* Sep 2006;48(9):873-882.
- Bernacki EJ, Tao XG. The relationship between attorney involvement, claim duration, and workers' compensation costs. *J Occup Environ Med.* Sep 2008;50(9):1013-1018.
- Bernacki EJ, Tao X, Yuspeh L. The impact of cost intensive physicians on workers' compensation. *J Occup Environ Med.* Jan 2010;52(1):22-28.
- Tao XG, Lavin RA, Yuspeh L, Bernacki EJ. Impact of the combined use of opioids and surgical procedures on workers' compensation cost among a cohort of injured workers in the state of Louisiana. *J Occup Environ Med.* Dec 2012;54(12):1513-1519.

Related Publications - 2

- Tao XG, Lavin RA, Yuspeh L, Bernacki EJ. Natural history of opioid dosage escalation post-injury: a cohort study of injured workers in the State of Louisiana. *J Occup Environ Med.* Apr 2012;54(4):439-444.
- White JA, Tao X, Talreja M, Tower J, Bernacki E. The effect of opioid use on workers' compensation claim cost in the State of Michigan. *J Occup Environ Med.* Aug 2012;54(8):948-953.
- Bernacki EJ, Yuspeh L, Lavin R, Tao XG. Increases in the use and cost of opioids to treat acute and chronic pain in injured workers, 1999 to 2009. *J Occup Environ Med.* Feb 2012;54(2):216-223.
- Lavin RA, Tao X, Yuspeh L, Bernacki EJ. Temporal relationship between lumbar spine surgeries, return to work, and workers' compensation costs in a cohort of injured workers. *J Occup Environ Med.* May 2013;55(5):539-543.
- Tao XG, Lavin RA, Yuspeh L, Bernacki EJ. Implications of lumbar epidural steroid injections after lumbar surgery. *J Occup Environ Med.* Feb 2014;56(2):195-203.

Related Publications - 3

- White, JA, Tao, X, Artuso RD, Biliknski, C, Rademacher, J., Bernacki EJ. The effect of physician dispensed medication on workers' compensation claims outcomes in the State of Illinois. JOEM,56:5:459-464, May 2014
- Lavin, R. A., Tao X, Yuspeh L, Bernacki EJ. Impact of the combined use of benzodiazepines and opioids on workers' compensation claim cost. J Occup Environ Med. 2014; 56(9):973-8.
- Tao XG, Lavin RA, Yuspeh L, Weaver VM, Bernacki EJ. Early Prescription of Opioid and Psychotropic Medications in Predicting Workers' Compensation Cost and Duration (in Process)