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Clinically Significant Weight Gain One Year After Occupational Back Injury

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Abstract

Objective—To examine the incidence of clinically significant weight gain one year after occupational back injury, and risk factors for that gain.

Methods—A cohort of Washington State workers with wage-replacement benefits for back injuries completed baseline and 1-year follow-up telephone interviews. We obtained additional measures from claims and medical records.

Results—Among 1,263 workers, 174 (13.8%) reported clinically significant weight gain (≥7%) 1 year after occupational back injury. Women and workers who had >180 days on wage replacement

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The manuscript submitted does not contain information about medical devices or drugs.

Conflicts of Interest:

No conflicts of interest were declared.

at 1 year were twice as likely (adjusted OR=2.17, 95% CI=1.54–3.07; adjusted OR=2.40, 95% CI=1.63–3.53, respectively; both P<0.001) to have clinically significant weight gain.

Conclusions—Women and workers on wage replacement >180 days may be susceptible to clinically significant weight gain following occupational back injury.

Keywords

clinically significant weight gain; occupational injury; back injury; prospective study; worker's compensation

Introduction

The dangers of obesity to general health and specific diseases are well-known. Obesity is strongly associated with a shorter lifespan, lower quality of life, and higher rates of cardiovascular disease, various cancers, and type-II diabetes.[1] In occupational settings, rates of back injury and increased workers' compensation costs are also associated with obesity, as are overall rates of occupational injury, lower worker productivity, and reporting of non-injury back pain.[2-5] Being overweight or obese is also associated with more workers' compensation claims, more lost workdays, higher medical claims costs, and higher indemnity claims costs.[4,6] Self-reported need for mental health services is associated with weight gain among injured workers.[7] Although much is known about obesity's impact on back injuries and workers' compensation, little is known about the extent of weight gain among injured workers or about the early predictors of weight gain.

We conducted an exploratory study, using a sample of workers with wage-replacement claims (at least one day of temporary total disability wage replacement) for work-related back injuries, to determine the incidence of clinically significant weight gain 1 year after occupational back injury. We expected that a subset of workers might gain a clinically significant amount of weight after injury (e.g., due to decreased physical activity and more time at home engaged in sedentary activities). If risk factors for such weight gain could be identified early after injury and before weight gain, preventive interventions might be developed. Therefore, a second objective of the study was to identify early predictors of clinically significant weight gain and develop an exploratory multivariate predictive model for weight gain. Finally, we explored the association of clinically significant weight gain with receipt of wage replacement (time-loss) benefits at 1 year after injury. We hypothesized that extended receipt of wage replacement benefits would be associated positively with weight gain. Based on previous research, we hypothesized that the following baseline variables would predict clinically significant weight gain 1 year after occupational back injury: higher baseline body mass index (BMI), greater injury severity, higher baseline pain and disability levels, lower work physical demands, greater worker fear-avoidance and worse mental health, lower education attainment, poor overall health status, an opioid prescription within 6 weeks after seeing a provider for the back injury, not using tobacco, and not returning to work by the baseline interview.[1,3,4,7-10,12-24]

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Methods

Sample

We used the Washington State Workers' Compensation Disability Risk Identification Study Cohort (D-RISC)[9] data to examine the prevalence of overweight and obesity at the time of injury, the incidence of clinically significant weight gain in the year after injury, and early predictors of weight gain 1 year after occupational back injury. In D-RISC, potential risk factors for chronic disability were assessed in domains of interest that were used previously for occupational injury research.[8-11] Eight domains (sociodemographic, employment-related, pain and function, clinical, health care, administrative/legal, health behavior, and psychological)[8] were assessed in baseline telephone interviews with workers with recent back injuries.

D-RISC was a prospective, population-based study that recruited Washington State Workers Compensation State Fund workers from June 2002 through April 2004 with accepted and provisional claims for occupational back injuries. Weekly claims review identified workers who missed at least 4 days from work and received wage replacement benefits (temporary total disability). Approximately two-thirds of the non-federal Washington workforce is covered by the State Fund. The remaining third are covered by large, self-insured companies and were not included due to insufficient administrative data.

In D-RISC, from the claims database, 4,354 workers were identified. Of those, 1178 (27.1%) could not be contacted, 909 (20.9%) declined enrollment, and 120 (2.8%) were ineligible.[9] The remaining 2,147 (49.3%) were enrolled in D-RISC and completed baseline interviews. Persons were later excluded from the analysis sample if they were not eligible for wage-replacement benefits in the first year after claim submission (n=240), were hospitalized for the injury (n=16), were missing information on age (n=3) or were not confirmed to have a back injury upon medical review (n=3).[9] Hence, 1,885 (43.3%) were included in D-RISC. Of the 1,885, 1,319 participants completed the follow-up interview approximately 1 year after claim receipt and 1,269 (96.2%) participants reported their weight during both interviews.

Upon inspection of the data, 16 participants had very large weight changes after 1 year (≥ 50 lbs). From additional administrative records, we were able to obtain other data on weight for 3 of the 16 participants, and used these data in the analyses. We excluded 6 of the 16 participants from analysis due to inconsistencies between self-report and clinical data that could not be reconciled. The self-reported and clinical data of the remaining 7 participants, among the 16, were very similar and the original self-reported weights were retained in the data, creating a final analysis sample of 1,263 participants.

The analysis sample was slightly older [mean age (SD) 40.3 (11.1) vs. 37.5 (11.2) years, $P < 0.001$], had fewer workers of Hispanic ethnicity (14% vs. 21%, $P = 0.008$), was more educated (less than high school 11% vs. 19%, $P < 0.001$), was more likely to be married or living with a partner (68% vs. 57%, $P < 0.001$), and contained more workers with general health insurance (72% vs. 60%, $P < 0.001$), as compared to the 622 persons who did not complete the follow-up survey or were excluded due to problematic weight data.

Measures

Study participants completed structured telephone interviews at baseline and at 1 year. Workers were asked their current weight in both interviews. The baseline interview also asked for participant height, which was used to determine baseline BMI (weight in pounds divided by (height in inches^2 x 703)).[25] Baseline measures for the current study were a subset of those obtained in the larger study, with selection based upon prior research pertaining to occupational injury, BMI, and weight and weight change. Additional data were obtained from the Washington State Department of Labor and Industries (DLI) claims database, including the region of the worker's residence, the worker's type of industry, the specialty of the first provider seen for the injury, and the number of days between the injury and the first medical visit for the injury. Additionally, medical record review by trained occupational nurses, with substantial inter-rater reliability, was used to determine injury severity.[11] (See Table 1 and the Appendix for more information about the measures.)

A weight gain at one year of at least 7% of baseline weight was used as a measure of clinically significant weight change.[14, 16 – 18] Definitions of clinically significant weight change are not consistent in the literature. Weight changes of any,[7] 3%,[27] and 5% have also been used,[12, 13, 28] but we chose the more conservative measure of a 7% gain.

To test our hypothesis that weight gain was associated with receiving wage replacement benefits at one year after claim submission, we used a measure of wage replacement receipt obtained from administrative records that corresponded to a similar timeline as our weight change measure: whether or not workers were receiving wage replacement benefits 365 days after the date the claim was received by DLI. Additionally, we categorized the accumulated days on wage replacement by 1 year after claim receipt (1 – 29, 30 – 89, 90 – 179, 180+ days) to determine if there was a dose-response relationship with clinically significant weight gain.

Statistical Analyses

We first conducted bivariate logistic regression analyses to examine associations between baseline variables of interest in each domain and clinically significant weight change, adjusted by age and gender. Missing, “don't know,” and refusal responses for each variable were combined into one response and included in the analysis. Variables with the most missing data included time from the date of injury to the first medical visit (n=36), region of worker residence (35), paid bill for an opioid prescription within 6 weeks of the first medical visit for the injury (33), recovery expectations (29), source of blame for the injury (26), days of work missed due to non-back health problems in the previous year (23), days of work missed due to back problems in the previous year (18), worker self-report of whether his/her supervisor listens to work-related problems (17), worker self-report of whether the employer had offered job accommodations to allow him/her to work (16), worker self-report of number of previous worker's compensation claims (11), and worker self-report of change in pain since the injury (11).

Next, we created a multivariate logistic regression model predicting clinically significant weight gain (yes/no). We entered as independent variables all baseline variables with P-values < 0.10 in the bivariate analysis, along with age and gender. A standard 0.05 P-value for determining statistical significance of bivariate associations may exclude variables that might be significant in a multivariate model.[29] Analyses were conducted with Stata Version 10.[30]

Results

Sample Characteristics

The sample of workers (N=1,263) was mostly non-Hispanic White (73%; 14% Hispanic; 14% other) and male (69%). At the baseline interview, 29.7% of the study participants were of normal weight (BMI < 25), 40.0% were overweight (25 ≤ BMI ≤ 30), and 30.3% were obese (BMI > 30). At one year, 174 (13.8%) participants self-reported weight that represented clinically significant (7%) weight gain from baseline and 103 (8.2%) participants gained more than 10% of their baseline weight. Sixty-two participants went from normal to overweight status, 66 went from overweight to obese, and 1 participant went from normal weight to obese, for a total of 129 (10.2%) participants with an increase in BMI category by 1 year.

Baseline predictors of weight gain in bivariate analyses

Table 1 shows the variables associated with clinically significant weight gain in the bivariate analyses. Six of 8 domains contained variables associated (P < 0.10) with weight gain. These included female gender (sociodemographics), having a fast-paced work environment prior to injury and not returning to work by the baseline interview (employment-related). The pain and function domain contained one predictor: activity interference due to pain was associated positively with weight gain. Worse current health, aside from injury, was the only predictor of weight gain in the clinical status domain. In the health care domain, weight gain was associated with the specialty of the first health care provider seen for the injury (occupational medicine specialist relative to primary care provider). Three variables were identified in the psychological domain: greater catastrophizing, poorer SF-36[40] Mental Health scale scores, and lower recovery expectations for the back injury were associated with weight gain. No factors from the administrative/legal or health behavior domains were associated with weight gain. Variables that were not associated with weight gain are listed in the Appendix; these include baseline BMI, injury severity, physical demands at work, fear-avoidance, education, opioid prescription for the injury, and tobacco use status.

Multivariate model predicting weight gain

Table 2 shows results from the multivariate model that included age and the 9 variables that were associated (P < 0.10) bivariately with clinically significant weight gain. Gender was the only significant predictor of clinically significant weight gain. Women had approximately twice the odds of weight gain, as compared to men (adjusted OR = 2.17, 95% CI 1.54 – 3.07).

Association of receiving wage replacement compensation with weight gain at one year

Receipt of wage replacement compensation at one year (189 of 1,263 participants) was associated with clinically significant weight gain after adjustment for age and gender (adjusted OR for receipt of wage replacement versus no wage replacement at one year = 2.24, 95% CI 1.51 – 3.33, P < 0.001; Table 3). Almost 25% of participants on wage replacement at 1 year after the injury had clinically significant weight gain, while 13.4% of those not receiving wage replacement compensation at 1 year gained significant weight. In the analysis examining categories of days on wage replacement, adjusting for age and gender, only wage replacement for more than 180 days was associated with clinically significant weight gain, compared to 1 – 29 days (adjusted OR 2.40, 95% 1.63 – 3.53, overall P < 0.001).

Discussion

To our knowledge, this is the first prospective study to examine the incidence and predictors of clinically significant weight gain after an occupational injury. Almost 14% of participants reported weight gain at 1 year of at least 7% of baseline weight. Female gender was the only significant early predictor. Additionally, receiving wage-replacement benefits at 1 year was highly associated with clinically significant weight gain.

In this sample, accrued from 2002 – 2004, the baseline distribution of workers in different BMI categories (29.7% normal weight, 40.0% overweight, 30.3% obese) was fairly similar to that in the 2000 general U.S. population (35.5%, 34%, and 30.5%, respectively).[31] The men in our sample had a slightly higher rate of obesity as compared to the national sample (29.7% versus 27.7%), whereas the women were less likely to be obese (31.5% versus 34.0%). The mean weight change of a 1.44 pound increase over 1 year in our sample was within the range of mean weight change in 1 year reported in previous studies of the American adult population (0.4 to 1.8 pound increases).[27,32–37] In one study of a racially and socioeconomically diverse sample, fewer than 10% of participants gained more than 3% of their body weight in 1 year, compared to 14% of participants gaining more than 7% of their body weight in our sample of injured workers.[27] In our data, men had an overall mean weight change of a 0.93 pound increase (SD 13.52) while women had a mean increase of 1.78 pounds (SD 14.4); these differences in overall weight change were not statistically significant (P = 0.31). One other study reported mean weight change separately by men and women over 1 year; those authors also found no statistical differences.[27]

Female gender was the only predictor of clinically significant weight gain. Other studies have noted that women in the United States have a higher prevalence of obesity, overweight, and weight gain compared to men.[27,49,50] However, one study noted that adult women appear to be leveling off for overweight and obesity prevalence, while adult men are still increasing yearly.[50] Of note, we were unable to discern pregnancy status in our data; one study noted that pregnancy status contributes to weight misreporting.[51]

Low recovery expectations (less certainty that he/she will be working in six months) at the baseline interview was associated significantly with clinically significant weight gain in bivariate analyses, but not statistically significant in the multivariate model. Low recovery expectations have been previously shown in this sample and in other studies to predict several outcomes of occupational back injury, including slower claim closure, slower end of payment benefits, and still being on disability leave after 6 months.[10, 52] Recovery expectations may have been associated with weight gain in our study, at least in part, due to its association with being off work for a longer period of time, which we found to be strongly associated with weight gain.

Self-reported poor or fair health, apart from the back injury, was associated with weight gain in bivariate analyses, but not in the multivariate model. Worse self-reported health has been associated with high BMI scores and weight gain in multiple studies.[53–55] Worse overall health may be associated with less physical activity, which may lead to weight gain.[56] In addition, worse health may be associated with greater use of medications that may cause weight gain.[53,57] These associations warrant study in further research.

Our work includes significant limitations. First, our outcome of weight gain is based upon two self-reported weights. Self-reported weight may not be accurate. However, in previous studies, participants appeared to misreport consistently, making multiple measures over time by an individual feasible to use in weight change research.[51,58–61] Additionally, persons who are already overweight or obese may underreport their weight compared to persons of normal weight. [58,59] A model including age, gender, and pregnancy status has been suggested as a method to adjust for weight misreporting;[51] age and gender were both included in our multivariate model. Another limitation is that our weight gain outcome is binary: whether the participant did or did not gain 7% of baseline body weight 1 year after occupational back injury. We did not assess weight trends among our sample in years prior to the injury. However, 7% weight gain is a marker for clinically significant weight change.[14,16–18] Additionally, we were unable to include in our analysis some key known correlates of weight gain, such as diet, exercise, and social support status.[62,63] We may also have sample selection bias; people who did not report their weight and thus were excluded from the study (n=50) may differ in important ways from those who reported their weight. If participants gained weight after the injury but before the baseline interview, we may be underestimating the proportion who gained clinically significant weight and thus underestimating some associations. Lastly, 30.0% of the D-RISC participants did not complete the 1-year follow-up interview, and we do not know whether results would have differed had weight at 1 year been available for the entire sample. We emphasize the exploratory nature of the analyses and the need to replicate findings in other samples.

This study has several strengths. These include a large, prospective, population-based sample in Washington State. We utilized different data sources (two telephone surveys, administrative data, and medical record review) for our variables among eight domains of interest. Our study is the first, to our knowledge, to explore variables associated with clinically significant weight gain in a cohort of workers with back injuries.

In sum, female workers with occupational back injuries were twice as likely as males to have clinically significant weight gain in the year after injury. In addition, receiving wage-replacement benefits 1 year after injury was associated with clinically significant weight gain. Approximately 10.8% of men and 20.3% of women in our sample gained a clinically significant amount of weight following an occupational back injury, possibly resulting in decreased quality of life, increased susceptibility to weight-influenced medical conditions, and increased medical costs. Factors influencing weight gain and obesity are multi-faceted and complex. Increasing our knowledge of weight gain may inform future interventions for preventing weight gain after occupational back injury.

Acknowledgments

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Appendix

Appendix

Non-Significant Bivariate Associations (P ≥ 0.10) of Baseline Variables with Clinically Significant Weight Gain (7%) by One Year after Initial Occupational Back Injury

Domain and variables	No significant weight gain N=1089	Significant weight gain N=174	Odds ratio^	95% CI	P-value
Sociodemographic					
Age, years (ref= 35-44 years)	339	53			0.14
≤24 years	94	17	1.16	0.64 – 2.09	
25 – 34 years	244	50	1.31	0.86 – 1.99	
45 – 54 years	289	43	0.95	0.62 – 1.47	
≥ 55 years	123	11	0.57	0.29 – 1.13	
Region of worker residence † (ref=urban)	633	97			0.64
Suburban	184	33	1.17	0.75 – 1.80	
Large town	124	22	1.14	0.68 – 1.89	
Rural	115	20	1.12	0.66 – 1.90	
Race/ethnicity (ref=White non-Hispanic)	798	122			0.34
Hispanic	142	30	1.35	0.86 – 2.11	
Other	149	22	0.88	0.54 – 1.45	
Education (ref=high school)	364	58			0.68
Less than high school	120	14	0.73	0.39 – 1.36	
Vocational or some college	495	84	1.05	0.73 – 1.52	
College	110	18	1.00	0.56 – 1.78	
Marital status (ref=married/living with partner)	748	114			0.78
Other	340	60	1.05	0.74 – 1.48	
Employment-related					
Worker's industry ‡ (ref=trade/transportation)	285	39			0.57
Natural resources	49	6	0.97	0.38 – 2.43	
Construction	201	27	1.11	0.65 – 1.89	
Manufacturing	83	8	0.75	0.34 – 1.68	
Management	192	26	0.96	0.56 – 1.64	
Education and health	155	36	1.25	0.73 – 2.14	
Hospitality	124	32	1.56	0.92 – 2.65	

Domain and variables	No significant weight gain N=1089	Significant weight gain N=174	Odds ratio^	95% CI	P-value
Heavy lifting (ref=not at all/rarely/ occasionally)	510	83			0.42
Frequently	363	51	0.90	0.61 – 1.32	
Constantly	215	39	1.19	0.78 – 1.83	
Whole body vibration (ref=not at all/rarely)	708	127			0.46
Occasionally/frequently	254	34	0.94	0.61 – 1.46	
Constantly	125	13	0.74	0.40 – 1.39	
Physical demands (ref=sedentary/light)	211	43			0.49
Medium	357	47	0.69	0.44 – 1.09	
Heavy	257	44	0.99	0.61 – 1.59	
Very heavy	258	39	0.85	0.52 – 1.40	
Excessive amount of work (ref=strongly disagree/disagree)	871	134			0.21
Strongly agree/agree	218	40	1.12	0.94 – 1.32	
Enough time to do job (ref=Strongly agree/ agree)	796	117			0.26
Strongly disagree/disagree	293	57	1.22	0.86 – 1.73	
Very hectic (ref=Strongly disagree/disagree)	313	39			0.60
Agree	494	85	1.30	0.86 – 1.96	
Strongly agree	279	49	1.12	0.70 – 1.78	
Supervisor listens to my work problems (ref=agree)	622	101			0.25
Strongly disagree/disagree	205	40	1.03	0.69 – 1.56	
Strongly agree	248	30	0.67	0.43 – 1.04	
Satisfaction with job (ref=Somewhat or very satisfied)	944	149			0.30
Not at all or not too satisfied	142	25	1.02	0.64 – 1.64	
Co-worker relations (0 – 10 scale, ref=10, get along extremely well)	570	90			0.87
8 – 9	394	67	1.07	0.75 – 1.51	
0 – 7	121	16	0.86	0.48 – 1.53	
Job type at time of injury (ref=full-time)	992	158			0.26
Part-time	97	15	0.71	0.39 – 1.29	
Seasonal job at injury (ref=no)	1020	167			0.35
Yes	68	7	0.68	0.30 – 1.52	
Temporary job at injury (ref=no)	1024	163			0.55
Yes	62	11	1.23	0.63 – 2.41	
Job duration ≥ 6 months	865	135			0.67
< 6 months	222	39	1.09	0.73 – 1.62	
Employer offered job accommodation (ref=Yes)	517	75			0.15
No	561	94	1.28	0.92 – 1.79	
Pain and function					

Domain and variables	No significant weight gain N=1089	Significant weight gain N=174	Odds ratio^	95% CI	P-value
Number pain sites (ref=0-2 sites)	528	70			0.21
3 – 4 sites	403	74	1.37	0.96 – 1.97	
5 – 8 sites	158	30	1.29	0.80 – 2.09	
Pain intensity, past week (0= no pain, ref= 0–3)[40]	291	41			0.79
4 – 5	289	43	0.99	0.62 – 1.58	
6 – 7	286	48	1.07	0.68 – 1.68	
8 – 10	223	42	1.24	0.77 – 1.99	
Pain interference with work, past week (0=no interference, ref=0-3)[40]	405	52			0.32
4 – 5	189	29	1.20	0.74 – 1.97	
6 – 7	192	33	1.35	0.84 – 2.18	
8 – 10	300	59	1.52	1.00 – 2.29	
Roland questionnaire € (0=no disability) (ref=0-8)[42]	326	47			0.23
9 – 16	386	53	0.95	0.62 – 1.45	
17 – 24	377	74	1.30	0.87 – 1.95	
SF-36 v2 Physical Function ¶ (ref=>50)[39]	276	39			0.26
41 – 50	209	27	0.93	0.55 – 1.57	
30 – 40	279	42	1.03	0.64 – 1.66	
< 30	325	66	1.40	0.90 – 2.18	
SF-36 v2 Role Physical ¶ (ref=>50)[39]	239	37			0.11
30 – 50	469	63	0.82	0.53 – 1.28	
< 30	381	74	1.22	0.79 – 1.90	
Pain change since injury (ref=better)	762	111			0.49
Same	198	42	1.36	0.92 – 2.02	
Worse	120	19	1.00	0.59 – 1.71	
Clinical status					
Injury severity †† (ref=mild strain/sprain)[11]	594	91			0.31
Major strain/sprain with substantial immobility but no evidence of radiculopathy	215	36	1.07	0.70 – 1.63	
Evidence of radiculopathy or abnormalities	273	47	1.15	0.78 – 1.70	
Pain radiates below knee (ref=no)	791	119			0.27
Yes	298	55	1.22	0.86 – 1.74	
Previous similar back injury (ref=no)	568	101			0.73
Yes	521	73	0.94	0.67 – 1.32	
Previous injury (any type) with ≥ 1 month off work (ref=no)	791	128			0.49
Yes	295	46	1.14	0.78 – 1.67	
Number of self-reported worker's compensation claims before current injury (ref=0)	402	64			0.40
1	328	49	1.06	0.70 – 1.60	

Domain and variables	No significant weight gain N=1089	Significant weight gain N=174	Odds ratio^	95% CI	P-value
2 – 3	236	40	1.31	0.84 – 2.04	
≥ 4	115	18	1.33	0.74 – 2.39	
Work days missed because of back, previous year (ref=0)	720	114			0.34
1 – 10	269	39	0.92	0.62 – 1.37	
> 10	87	16	1.31	0.73 – 2.33	
Work days missed because of other health problems, previous year (ref=0)	458	56			0.20
1 – 10	536	98	1.34	0.94 – 1.91	
> 10	78	14	1.26	0.66 – 2.40	
Number other major medical problems (ref=0)	906	147			0.99
≥ 1	182	27	1.00	0.63 – 1.60	
General health, year prior to injury (ref=excellent)	262	33			0.23
Very good	415	62	1.16	0.74 – 1.83	
Good	320	58	1.39	0.88 – 2.21	
Fair/poor	90	21	1.71	0.93 – 3.13	
Opioid Rx within 6 weeks of injury (ref=no)	703	109			0.64
Yes	359	59	1.07	0.76 – 1.52	
Health care					
Health care provider recommended exercise (ref=yes)	768	126			0.66
No	319	48	0.92	0.64 – 1.33	
Health insurance (ref=yes)	787	119			0.32
No	301	54	1.13	0.79 – 1.62	
Administrative/legal					
Time from injury to first medical visit for injury◇ (ref=0-6 days)	845	123			0.12
7 – 13 days	119	26	1.66	1.03 – 2.66	
≥ 14 days	96	18	1.33	0.77 – 2.30	
Health behavior					
Tobacco use (ref=no)	591	92			0.63
Occasionally/frequently	166	23	0.90	0.55 – 1.48	
Daily	332	59	1.14	0.80 – 1.63	
Alcohol Use Disorder Identification Test-Consumption (AUDIT-C)^^ (ref=negative, AUDIT-C score of 0 – 3 for males, 0 – 2 for females)[41]	755	129			0.30
Positive (4 – 12 for males, 3 – 12 for females)	331	44	0.77	0.53 – 1.12	
Baseline Body Mass Index (BMI) (ref=<25)	318	57			0.89
25 – 29 (overweight)	443	63	0.92	0.62 – 1.37	
≥ 30 (obese)	328	54	1.00	0.67 – 1.51	
Psychological					

Domain and variables	No significant weight gain N=1089	Significant weight gain N=174	Odds ratio^	95% CI	P-value
Blame for injury[39] (ref=work)	527	91			0.41
Self	230	27	0.72	0.45 – 1.14	
Someone/something else	151	30	1.11	0.70 – 1.75	
Nothing/no one	160	21	0.80	0.48 – 1.33	
Work fear-avoidance (ref= <3, very low)◇◇	214	28			0.31
Low-moderate (>3 – <5)	358	51	1.11	0.68 – 1.82	
High (5 – 6)	517	95	1.37	0.87 – 2.15	

Missing, “don't know,” and refusal responses for each variable were combined into one response for each variable (results not shown)

Ref indicates reference group.

All measures were obtained from worker baseline interviews except where noted

^All odds ratios were adjusted for age and gender, except for age

†By residential zip code, using the Washington State guidelines classifications at http://www.doh.wa.gov/Data/Guidelines/RuralUrban

‡Derived from Standard Industrial Codes (SIC)

€Roland-Morris Disability Questionnaire assesses overall back disability[42-44]

¶Scores from the Short-Form-36 version 2 (SF-36v2) Physical Function and Role Physical scales; higher scores indicate better functioning[39]

††Rated by trained nurses based on medical records early in the claim

◇From worker's compensation database

^^The AUDIT-C score is a screening test for problematic alcohol usage[41]

◇◇Mean of responses to two questions from the Fear-Avoidance Beliefs Questionnaire work scale[46]

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Clinical Significance

Fourteen percent of workers gained significant weight (≥7% of baseline weight) by one year after occupational back injury. Female gender and being on wage-replacement status for more than 6 months were highly associated with weight gain. Knowledge concerning risk factors for weight gain may inform future prevention strategies.

Table 1

Baseline Variables Associated Bivariately (P < 0.10) with Clinically Significant Weight Gain (7%) One Year after Baseline Interview

Domain and variables	No significant weight gain n=1089 (%)	Significant weight gain n=174 (%)	Odds ratio ^	95% CI	P-value
Sociodemographic					
Gender (ref=male)	775 (89.2)	94 (10.8)			< 0.001
Female	314 (79.7)	80 (20.3)	2.10	1.52 – 2.91	
Employment-related					
Fast pace (ref=strongly disagree/disagree)	277 (89.9)	31 (10.1)			0.09
Agree	441 (86.5)	69 (13.5)	1.34	0.85 – 2.13	
Strongly agree	366 (83.2)	74 (16.8)	1.57	0.99 – 2.48	
Returned to paid work by baseline interview (ref=Yes, same job)	365 (88.6)	47 (11.4)			0.02
Yes, light duty or different job	293 (88.0)	40 (12.0)	1.02	0.65 – 1.61	
No	431 (83.2)	87 (16.8)	1.61	1.09 – 2.37	
Pain and function					
Pain interference with daily activities, past week (0=no interference, ref=0-3)[40]	379 (88.8)	48 (11.2)			0.04
4 – 5	250 (88.3)	33 (11.7)	1.06	0.66 – 1.70	
6 – 7	188 (81.7)	42 (18.3)	1.75	1.11 – 2.76	
8 – 10	270 (84.6)	49 (15.4)	1.40	0.90 – 2.18	
Clinical status					
Current health aside from injury (ref=excellent)	219 (89.0)	27 (11.0)			0.01
Very good	424 (88.1)	57 (11.9)	1.08	0.66 – 1.76	
Good	336 (84.4)	62 (15.6)	1.45	0.89 – 2.37	
Fair/poor	110 (80.3)	27 (19.7)	1.90	1.06 – 3.43	
Health care					
Specialty, first provider seen for injury ◇ (ref=primary care)	412 (88.2)	55 (11.8)			0.095
Occupational medicine	60 (78.9)	16 (21.1)	2.06	1.10 – 3.87	
Chiropractor	302 (84.6)	55 (15.4)	1.46	0.97 – 2.20	
Other	315 (86.8)	48 (13.2)	1.19	0.78 – 1.82	
Administrative/legal (No significant variables)					
Health behavior (No significant variables)					
Psychological					
Catastrophizing ‡‡ (ref=0-1)	352 (89.1)	43 (10.9)			0.06
Low (>1 – <2)	173 (85.2)	30 (14.8)	1.44	0.87 – 2.40	
Moderate (2 – <3)	334 (87.4)	48 (12.6)	1.13	0.72 – 1.76	
High (3 – 4)	230 (81.3)	53 (18.7)	1.78	1.14 – 2.78	
Recovery expectations[39] (0-10 scale, 10 = extremely certain will be working in 6 months, ref=10)	651 (88.8)	82 (11.2)			0.01
High (7 – 9)	215 (83.3)	43 (16.7)	1.61	1.08 – 2.42	

Domain and variables	No significant weight gain n=1089 (%)	Significant weight gain n=174 (%)	Odds ratio^	95% CI	P-value
Low (0 – 6)	198 (81.5)	45 (18.5)	1.84	1.23 – 2.76	
SF-36 v2 Mental Health ¶ (ref=>50)[39]	449 (88.6)	58 (11.4)			0.07
41 – 50	275 (87.3)	40 (12.7)	1.09	0.70 – 1.68	
≤ 40	365 (82.8)	76 (17.2)	1.52	1.04 – 2.22	

All measures were obtained from worker baseline interviews unless stated otherwise

Missing, “don't know,” and refusal responses for each variable were combined into one response for each variable (results not shown)

Ref indicates reference group.

^All odds ratios were adjusted for age and gender, except for gender

¶Score from the Short-Form-36 version 2 (SF-36v2) Mental Health scale; higher scores indicate better functioning[39]

◇From worker's compensation database

##Mean of responses to three questions from the Pain Catastrophizing scale[45]

Table 2

Multivariate Model Predicting Clinically Significant Weight Gain (7%) at One Year from Baseline Variables Associated Bivariately with Weight Gain

Baseline Predictor	Adjusted OR^	95% CI	P-value
Age, yr (ref = 35 – 44)			0.14
≤ 24	1.12	0.60 – 2.08	
25 – 34	1.41	0.91 – 2.19	
45 – 54	0.96	0.61 – 1.51	
≥ 55	0.59	0.29 – 1.21	
Gender (ref=male)			< 0.001
Female	2.17	1.54 – 3.07	
Fast pace (ref=strongly disagree /disagree)			0.40
Agree	1.20	0.75 – 1.92	
Strongly agree	1.43	0.89 – 2.30	
Return to paid work by baseline interview (ref=Yes, same job)			0.30
Yes, light duty or different job	1.00	0.62 – 1.60	
No	1.35	0.87 – 2.10	
Pain interference with daily activities, past week (0=no interference, ref=0-3)[39]			0.58
4 – 5	0.92	0.55 – 1.53	
6 – 7	1.29	0.75 – 2.21	
8 – 10	0.93	0.53 – 1.64	
Current health aside from injury (ref=excellent)			0.14
Very good	1.12	0.67 – 1.85	
Good	1.45	0.87 – 2.40	
Fair/poor	1.86	1.00 – 3.45	
Specialty, first provider seen for injury ◇ (ref=primary care)			0.15
Occupational medicine	1.85	0.97 – 3.53	
Chiropractor	1.43	0.94 – 2.18	
Other	1.08	0.70 – 1.67	
Catastrophizing ‡‡ (ref=0-1)			0.38
Low (>1 – <2)	1.29	0.76 – 2.21	
Moderate (2 – <3)	0.92	0.56 – 1.51	
High (3 – 4)	1.29	0.76 – 2.22	
Recovery expectations[32] (0-10 scale, ref=10, 10 = extremely certain will be working in 6 month)			0.08
High (7 – 9)	1.45	0.92 – 2.28	
Low (0 – 6)	1.53	1.00 – 2.33	
SF-36 v2 Mental Health (ref=>50)[39]			0.86
41 – 50	0.89	0.56 – 1.42	
≤ 40	0.99	0.62 – 1.57	

Each baseline variable included in this table was associated significantly ($P < 0.10$) in bivariate analyses with clinically significant weight gain by one year of initial occupational back injury.

Age was included as an adjusting variable.

Missing, “don't know,” and refusal responses for each variable were combined into one response for each variable (results not shown)

Ref indicates reference group.

^Adjusted for all other variables in the multivariate model.

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Table 3

Associations of Clinically Significant Weight Gain (7%) at 1 Year and Wage Replacement Status by 1 Year after Occupational Back Injury, adjusted for age and gender

	Wage Replacement Status	# Persons (N=1,263)	Adjusted OR	95% CI	P-Values
At 1 Year	No	1,070			<0.001
	Yes	193	2.24	1.51 – 3.33	
By 1 Year	1 – 29 days	754			<0.001
	30 – 89 days	163	1.17	0.69 – 1.98	
	90 – 179 days	98	1.37	0.74 – 2.55	
	> 180 days	248	2.40	1.63 – 3.53	