

Early high-risk opioid prescribing and persistent opioid use in Australian workers with workers' compensation claims for back and neck musculoskeletal disorders or injuries: A retrospective cohort study

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Appendices

Supplementary table 1: Eligibility criteria for inclusion

Claims for back and neck related conditions identified by Type of Occurrence Classification System (TOOCS) and that satisfy both requirements of TOOCS nature of injury/illness and location of injury and disease minor codes as follows.

Claims	Included (Back and neck related conditions)
TOOCS location of injury and disease minor codes	210 (Neck bones, muscles and tendons), 211 (Neck - internal organs and glands), 218 (Neck - other and multiple), 219 (Neck – unspecified), 310 (Upper back), 311 (Lower back), 318 (Back - other and multiple), 319 (Back – unspecified)
+	
TOOCS nature of injury/illness minor codes	218 (Trauma to joints and ligaments, not elsewhere classified), 222 (Traumatic tearing away part of the muscle/tendon structure, avulsion), 223 (Trauma to muscles), 224 (Trauma to tendon), 228 (Trauma to muscles and tendons, not elsewhere classified), 229 (Trauma to muscles and tendons, unspecified), 239 (Soft tissue injuries due to trauma or unknown mechanisms), 401 (Osteoarthritis/osteoarthrosis), 402 (Inflammatory arthritis/arthropathies), 404 (Arthropathies not elsewhere classified), 405 (Arthropathies, unspecified), 459 (Back pain, lumbago, and sciatica), 422 (Disc displacement, prolapse, degeneration or hernia), 423 (Infectious diseases involving the spine), 479 (Neck pain, cervicalgia spondylitis involving the neck, torticollis), 488 (Spinal vertebrae and intervertebral discs diseases), 489 (Spinal vertebrae and intervertebral discs diseases, unspecified), 526 (Tendinitis), 533 (Muscle/tendon strain non-traumatic), 542 (Occupational overuse syndrome), 548 (Fibromyalgia, fibrositis and myalgia) and 557 (Complex regional pain syndrome)

Supplementary Table 2a: Model Selection- Bayesian Information criterion (BIC) of models with varying number of trajectory groups

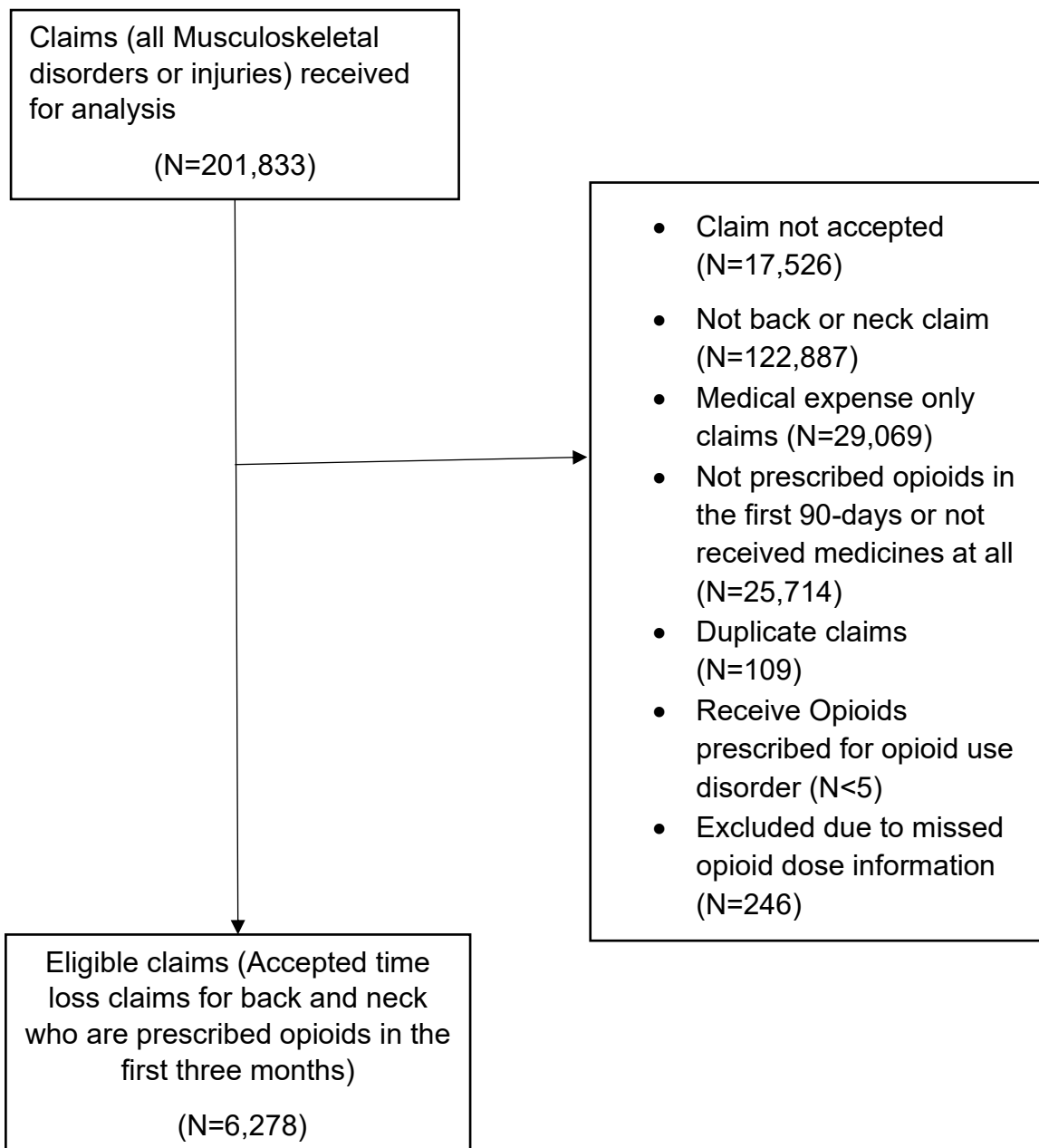
	Number of trajectory groups					
Polynomial order	1	2	3	4*	5	6 (variance matrix is singular)
1	-35620.86					
2	-35619.11	-24322.19	-23206.96			
3*	-35623.04	-24329.72	-23208.94	-22859.69	-22768.20	
4	-35625.74	-24335.31	-23219.76	-22871.83	-22782.58	-22757.70
5	-35630.02	-24343.47	-23232.53	-22888.39	-22836.73 (variance matrix is singular)	-22772.54

**3rd order polynomial with 4 trajectory groups selected*

Supplementary Table 2b: Model Selection- Akaike Information Criterion (AIC) of models with varying number of trajectory groups

	Number of trajectory groups					
Polynomial order	1	2	3	4*	5	6
1	-35614.11					
2	-35608.99	-24298.58	-23169.86			
3*	-35609.55	-24299.37	-23161.73	-22795.62	-22687.26	
4	-35608.88	-24298.21	-23162.43	-22794.26	-22684.78	-22639.67
5	-35609.78	-24299.63	-23165.09	-22797.34	-22722.07	-22634.27

**3rd order polynomial with 4 trajectory groups selected*



Supplementary figure 1: Flow diagram of the final study sample selection and exclusion criteria

Supplementary table 3: Sensitivity analysis on determinants of early high-risk opioid prescribing after excluding non-sedating antidepressants in the high-risk definition

Characteristics	Adjusted OR with 95% CI
Sex	
Male	1.10(0.97, 1.26)
Female	1 (ref)
Age group	
15-24 year	1 (ref)
25-34 year	1.28(0.98, 1.68)
35-44 year	1.34(1.03, 1.75) *
45-54 year	1.30(1.00, 1.69)
55-64 year	1.15(0.87, 1.51)
65 or more	1.09(0.65, 1.82)
Socioeconomic status (IRSAD)	
First quintile	0.90(0.78, 1.04)
Middle three quintile	1 (ref)
Fifth quintile	0.96(0.83, 1.12)
Remoteness	
Major cities of Australia	1 (ref)
Inner regional Australia	1.24(1.09, 1.42) ***
Outer regional Australia	1.39(1.07, 1.81) *
Occupational group	
Managers and administrators	1 (ref)
Professionals	0.81(0.59, 1.12)
Associate Professionals	0.68(0.49, 0.95) *
Tradespersons and related workers	0.74(0.54, 1.02)
Advanced clerical and service workers	0.85(0.47, 1.55)
Intermediate clerical, sales and service workers	0.62(0.45, 0.85) **
Intermediate production and transport workers	0.72(0.52, 0.98) *
Elementary clerical, sales and service workers	0.75(0.51, 1.10)
Laborers and related workers	0.75(0.55, 1.02)
Location of injury	
Neck	1 (ref)
Back	0.91(0.77, 1.08)
Nature of injury major class	

Musculoskeletal and connective tissue disease	1.24(0.80, 1.91)
Traumatic joint/ligament and muscle /tendon injuries	1 (ref)
Year of claim received	
2010	1 (ref)
2011	1.12(0.91, 1.38)
2012	1.08(0.87, 1.33)
2013	1.09(0.88, 1.35)
2014	1.17(0.94, 1.46)
2015	1.27(1.02, 1.59) *
2016	1.58(1.26, 2.00) ***
2017	1.66(1.30, 2.10) ***
2018	1.47(1.16, 1.86) ***
2019	1.48(1.15, 1.91) **

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$

Supplementary table 4: Sensitivity analysis on determinants of persistence opioid use at 1-year after excluding non-sedating antidepressants in the high-risk opioid prescribing definition

Characteristics	Adjusted OR with 95% CI
High-risk opioid prescribing in the first 90 days	
No	1 (ref)
Yes	2.13(1.84, 2.46) ***
Sex	
Male	0.86(0.74, 1.01)
Female	1 (ref)
Age group	
15-24 year	1 (ref)
25-34 year	1.3(0.92, 1.84)
35-44 year	1.35(0.96, 1.9)
45-54 year	1.32(0.94, 1.86)
55-64 year	1.05(0.74, 1.51)
65 or more	0.64(0.31, 1.33)
Socioeconomic status (IRSAD)	
First quintile	1.18(1.01, 1.39) *
Middle three quintile	1 (ref)
Fifth quintile	0.67(0.55, 0.82) ***
Remoteness	
Major cities of Australia	1 (ref)
Inner regional Australia	0.99(0.85, 1.15)
Outer regional Australia	0.99(0.75, 1.31)
Occupational group	
Managers and administrators	1 (ref)
Professionals	0.98(0.67, 1.43)
Associate Professionals	1.06(0.72, 1.56)
Tradespersons and related workers	0.96(0.66, 1.39)
Advanced clerical and service workers	0.61(0.27, 1.39)

Intermediate clerical, sales and service workers	0.94(0.65, 1.38)
Intermediate production and transport workers	1.17(0.82, 1.68)
Elementary clerical, sales and service workers	1.05(0.67, 1.65)
Laborers and related workers	1.13(0.79, 1.61)
Location of injury	
Neck	1 (ref)
Back	0.92(0.76, 1.11)
Nature of injury major class	
Musculoskeletal and connective tissue disease	1.11(0.67, 1.85)
Traumatic joint/ligament and muscle /tendon injuries	1 (ref)
Return to work status at 3 months	
Yes	1 (ref)
No	7.63(5.75, 10.13) ***
Year of claim received	
2010	1 (ref)
2011	1.06(0.83, 1.37)
2012	0.95(0.74, 1.23)
2013	1.03(0.80, 1.34)
2014	1.11(0.86, 1.44)
2015	0.77(0.59, 1.01)
2016	1.16(0.90, 1.50)
2017	0.96(0.73, 1.26)
2018	0.93(0.70, 1.22)
2019	1.16(0.85, 1.58)

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$

Supplementary table 5: Sociodemographic and injury characteristics of workers with back and neck conditions who have unique workers' compensation claims for work disability during the study period (N=30,590)

Characteristics	Total (%)	Prescribed opioids in the first 90 days		P-value
		Yes	No	
	30590	6278 (20.5%)	24312 (79.5%)	
Sex				0.106
Female	11501(37.6%)	2305(36.7%)	9196(37.8%)	
Male	19089(62.4%)	3973(63.3%)	15116(62.2%)	
Age group				<0.001
15-24 year	2768(9.1%)	279(4.4%)	2489(10.2%)	
25-34 year	6792(22.2%)	1242(19.8%)	5550(22.8%)	
35-44 year	7653(25.0%)	1806(28.8%)	5847(24.1%)	
45-54 year	8042(26.3%)	1832(29.2%)	6210(25.5%)	
55-64 year	4877(15.9%)	1036(16.5%)	3841(15.8%)	
65 or more	458(1.5%)	83(1.3%)	375(1.5%)	
Socioeconomic status (IRSAD)*				<0.001
First quintile	4972(16.3%)	1095(17.4%)	3877(16.0%)	
Middle three quintile	20238(66.2%)	4205(67.0%)	16033(16.0%)	
Fifth quintile	5312(17.4%)	962(15.3%)	4350(17.9%)	
Remoteness #				0.006
Major cities of Australia	22353(73.1%)	4488(71.5%)	17865(73.5%)	
Inner regional Australia	6847(22.4%)	1472(23.5%)	5375(22.1%)	
Outer regional, remote & very remote Australia	1364(4.5%)	310(4.9%)	1054(4.3%)	
Occupational group				<0.001
Managers and administrators	917(3.0%%)	251(4.0%)	666(2.7%)	
Professionals	3536(11.6%)	780(12.4%)	2756(11.3%)	
Associate Professionals	2870(9.4%)	589(9.4%)	2281(9.4%)	
Tradespersons and related workers				
Advanced clerical and service workers	333(1.1%)	62(1%)	271(1.1%)	

Intermediate clerical, sales and service workers	4098(13.4%)	823(13.1%)	3275(13.5%)	
Intermediate production and transport workers	5996(19.6%)	1225(19.5%)	4771(19.6%)	
Elementary clerical, sales and service workers	1234(4.0%)	260(4.1%)	974(4.0%)	
Laborers and related workers	6462(21.1%)	1273(20.3%)	5189(21.3%)	
Location of injury				0.564
Back	27014(88.3%)	5531(88.1%)	21483(88.4%)	
Neck	3576(11.7%)	747(11.9%)	2829(11.6%)	
Nature of injury major class				0.001
Musculoskeletal and connective tissue disease	29967(98.0%)	6183(98.5%)	23784(97.8%)	
Traumatic joint/ligament and muscle/tendon injuries	623(2.0%)	95(1.5%)	528(2.2%)	
Return to work status at 3 months				<0.001
Yes	14459(47.3%)	1214 (19.3%)	13245(54.5%)	
No	16131(52.7%)	5064 (80.7%)	11067(45.5%)	
Year claim received				0.002
2010	3607(11.8%)	775 (12.3%)	2832(11.7%)	
2011	3473(11.4%)	737 (11.7%)	2736(11.3%)	
2012	3446(11.3%)	738 (11.8%)	2708(11.1%)	
2013	3240(10.6%)	679 (10.8%)	2561(10.5%)	
2014	2980(9.7%)	599 (9.5%)	2381(9.8%)	
2015	3016(9.9%)	666 (10.6%)	2350(9.7%)	
2016	2830(9.3%)	587 (9.4%)	2243(9.2%)	
2017	2833(9.3%)	535 (8.5%)	2298(9.5%)	
2018	2889(9.4%)	541 (8.6%)	2348(9.7%)	
2019	2276(7.4%)	421 (6.7%)	1855(7.6%)	

**68 missing information socioeconomic status, #26 missing on remoteness of location
IRSAD-Index of relative socioeconomic advantage and disadvantage*