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BETTER PAIN MANAGEMENT APPROACHES

RAPID REVIEW

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Summary

Chronic pain can be a serious burden for many people, affecting all aspects of their lives. For some people, injury sustained in a motor vehicle crash, or at work, can result in life-long difficulties, with chronic pain a very significant factor contributing to diminished quality of life and wellbeing. Consequently, the global negative impact of chronic pain cannot be underestimated. Among people injured in MVCs and with work injuries, persistent pain in these populations is a common and costly public health problem. Chronic pain is also known to negatively influence other problems such as physical disability and impairment, psychological disorder, employment and financial stress, social isolation, family relationship stress, as well as distress associated with compensation claims that can take many months to resolve. In Australia, approximately 20% of those reporting chronic pain are in receipt of workers compensation benefits (*Access Economics 2007*).

In order to manage chronic pain effectively, a multi-disciplinary team of health professionals may be necessary to address the many dimensions of the problem. Furthermore, people with chronic pain should not rely solely on pain medications or medical procedures for relief from their pain. Overall, the evidence for medical interventions in chronic pain is weak. The biopsychosocial model is considered essential in pain and provides a framework for understanding how different diseases are related through an assessment of sensory, cognitive/affective, and interpersonal factors. The management of chronic pain generally requires a broad whole person treatment approach which addresses the multiple aspects of pain and lifestyle. “Active self-management” is a key component, along with targeted medical and health professional input and appropriate social support. The focus is on making gradual change and assessing response. The aim in chronic pain is to “retrain the brain”. Reduction in pain and disability usually happens slowly over a 6 to 12 month period, although at times rapid improvement can occur. Evidence now exists for the efficacy of non-pharmacological pain management approaches, cognitive behavioural therapy (CBT) based programs, and strategies used to help people self-manage their pain and mood, and consequently enhance their quality of life.

These strategies apply to all people with chronic pain. If the person with chronic pain is involved in a compensation scheme this can be a complicating factor because it is well established that chronic pain is more likely in these situations. There may be factors inherent in the compensation scheme that can worsen or improve chronic pain and examination of scheme related factors should also be considered. The prime negative examples are fault-based schemes and schemes that provide excessive treatments with inadequate focus on returning to work and usual activity.

Contents

Rapid reviews methodology

The following steps were used to perform this rapid review:

Rapid review: research questions

SIRA regulates the NSW compulsory personal injury schemes and has a mandate to provide funding for injury prevention, injury minimisation and road safety education.

This review will address the following three questions:

Question 1: Is pain a problem for people injured at work or on the roads in NSW in compensation schemes?

Question 2: What are the risks/harms of pain experienced by people in compensation schemes? (i.e. the impact of pain)

Question 3: What interventions are effective in pain management? What works to reduce these harms?

Appendix A sets out the methods used for this rapid review.

Question 1: Is pain a problem for people injured at work or on the roads in NSW in compensation schemes?

There are multiple possible contributors to pain. At times, pain can relate predominantly to bodily injury, as is typical of acute pain. However, if pain persists for more than 3 months (i.e. chronic pain, also sometimes termed persistent pain), additional factors are often involved. Several studies have demonstrated that among persons experiencing motor vehicle crashes (MVC), the greatest predictors of widespread pain are individual-level factors and the psychological milieu, rather than aspects of the trauma itself (*Jones 2011*). Wynne-Jones and colleagues identified another five independent risk factors namely - older age, pre-accident adverse health behaviour and somatic symptoms, post-accident symptom count, and perceived injury severity (*Wynne-Jones 2006*). Another study showed that significant predictors of moderate or severe neck pain were female gender, pain and somatic symptom severity in the early stage after the vehicle crash, cognitive characteristics such as pain catastrophizing, and collision characteristics (e.g., seat belt use) (*McLean 2013*).

The World Health Organization (WHO) predicts that by 2030, the leading contributors of global burden of disease will be depression, coronary heart disease, cerebrovascular disease, and injury arising from MVC, with the latter projected to become the third leading cause (*WHO 2008*). Certainly, chronic pain can be a significant co-morbidity in these four conditions, especially so in traumatic injury sustained in MVC. Consequently, the global negative impact of chronic pain cannot be underestimated. Among people injured in MVC, persistent pain in this population is a common and costly public health problem (*McLean 2013*). After MVC, disabling pain affects one in every three to four persons 3 years later, making injury a significant cause of chronic pain in the community (*Holmes 2010 and Holmes 2013*). In Australia, approximately 20% of those reporting chronic pain are in receipt of workers compensation benefits (*Access Economics 2007*). Chronic pain is one of the most prevalent, costly and disabling conditions in both clinical practice and the workplace environment, yet often remains inadequately treated. Chronic pain is also among the most common reasons for temporary as well as permanent work disability (*Smith 2001*). Compensable injury, or the eligibility for and/or pursuit of an injury compensation claim, paradoxically leads to worse outcomes, including chronic and disabling pain. This is despite the fact that compensation claimants are typically entitled to more benefits to support recovery, including healthcare and income replacement, and some may receive lump sum payments depending on the setting. A study involving 17,497 people randomly sampled from the Australian community, and assessed for presence of chronic pain, found 20% (n = 3,598) had chronic pain, and prevalence rates increased to around 30% with advancing years (*Blyth 2001*).

As per the Australian National Pain Strategy report, allocated health expenditure data ranked chronic pain third among the National Health Priority Areas, with expenditure on chronic pain estimated at around $4.4 billion in 2000-2001 (the most recent year for which comparable disease health expenditure data were available). There is no evidence about how much pain is a problem in compensable population in NSW, i.e. people injured at work or on the roads in NSW. Therefore, similar information about compensable population is not available but, in general the report also found that:

- In 2007, around 3.1 million Australians were estimated to experience chronic pain and was projected to increase to 5.0 million by 2050 as Australia's population ages.
- The high cost of chronic pain was a result of both its high prevalence and high impact on quality of life and productivity (productivity costs comprised up to $11.7 billion annually).
- 55% of the total cost of chronic pain was borne by individuals with chronic pain. The next largest share was borne by the Federal Government (22%), and the remainder by State/Territory Governments (5%), employers (5%), family and friends (3%), and society (10%).

Facts and figures

Globally, in compensable population

- In a prospective pain study conducted on motor vehicle and workplace accident patients, reported that 44% of the patients reported some accident-related pain at 3 years after admission (*Jenewein 2009*)
- Another prospective study reported that pain was more likely in those with lower education, lower self-efficacy, and higher pre-injury alcohol use (*Castillo 2006*).
- Approximately one third of those who attended an emergency department after road trauma also report complex psychological problems (eg, post-traumatic stress disorder [PTSD], fear of driving or traveling, anxiety and mood disorders such as depression and emotional distress) within 1 year, even after minor injury (*Mayou 2014*).

In compensable population in Australia

- A prospective long-term cohort study (Gopinath 2019) concluded that at the 6- and 12-month follow-up of people with motor vehicle injury, 21% and 17.5% reported clinically significant pain (NRS score of ≥5), respectively. The study also suggested the key predictors of pain severity ratings over the 12 months included the following:
  - ✓ *Age*
  - ✓ *Gender*
  - ✓ *Education*
  - ✓ *Claim compensation*
  - ✓ *Spine/back injury*
  - ✓ *Being a bicyclist*
  - ✓ *Physical well-being*
  - ✓ *Pain-related catastrophizing*
  - ✓ *Pain-related disability and*
  - ✓ *Trauma-related and general psychological distress*
- Approximately 20% of those reporting chronic pain are in receipt of workers compensation benefits (*Access Economics 2007*).
- In a retrospective long-term cohort study (*Gopinath 2015*), adults aged 18 years or older who lodged a compensation claim in NSW for mild to moderate injuries (e.g. neck/whiplash, fractures) following a MVC, were found to have numerical rating scale (NRS) scores of pain intensity at levels considered to indicate clinically significant pain, i.e., NRS $\underline{\geq}$ 24 at 24 months after injury.
- In Western Australia each year, approximately 1 out of every 100 workers have work-related pain that results in a workers compensation claim and requires at least one week off work. Around 80% of people manage to return to work following time off due to work related pain. 'Sprains and strains' account for over half of work-related pain and are most common among workers involved in manual labour. The low back / spine is the most frequently affected region, but the upper limbs and lower limbs are also commonly affected.

Question 2: What are the impacts of pain experienced by people in compensation schemes?

Pain is one of the foremost reasons for which people seek medical attention. In USA, it is estimated that 100 million people suffer from pain, with approximately 25 million experiencing acute pain from injury and 75 million suffering with chronic pain conditions. Pain can negatively impact a person's quality of life, causing functional impairment and disability, psychological distress (e.g. anxiety and depression), and sleep deprivation (*National Prescribing Service 2014*). Additionally, undertreated or unrelieved pain places a heavy burden on taxpayers and employers, with an annual cost of over $66 billion per year due to lost income, decreased productivity, and medical expenses (*Deloitte Access Economic 2019; van Leeuwen 2006*). It is widely established that pain has a profound effect on a person's quality of life. Studies performed in different settings have demonstrated that chronic pain affects between 10% and 30% of the adult population in Europe (*Reid 2011*). Another study showed a 16.6% prevalence of this condition among the general population in Spain, with at least one person affected in every four Spanish homes (*Dueñas 2015*). In a state-wide survey conducted in 1997 in NSW, Australia with more than 17,000 respondents reported an overall pain prevalence of 20% in females and 17% in males (*Blyth 2001*).

A study conducted in Victoria reported that a quarter of patients after a moderate or severe injury have chronic pain at 3 years, and a third report at least moderate pain-related disability. Similar to patients assessed at earlier time points, chronic pain was more likely in those with socioeconomic disadvantage, higher initial pain, and greater injury severity, although the predicative power of these combined factors was less than that reported for earlier time points. Psychological measures taken in the acute setting were not able to predict pain-related disability, but compensation status appeared to play an important role (*Holmes 2013*).

People who are struggling with chronic pain may become addicted to pain medications, such as opioids, and abuse of such drugs can have very damaging health, psychological, financial and employment impacts (*Pergolizzi 2012*). Risk of opioid abuse increases with factors such as multiple prescriptions, clinically high pain intensity, presence of psychological disorders like depression, suicidal ideation and psychoses; older age, and a history of substance abuse (*Pergolizzi 2012*).

In Australia, the total financial costs associated with chronic pain were estimated to be $73.2 billion in 2018, which equates to $22,588 per person with chronic pain (*Deloitte Economics Access 2019*). It is estimated that in the absence of any changes to the health system, these costs are expected to rise up to $215.6 billion by 2050. The summary of the total financial cost of chronic pain in Australia in 2018 and costs associated with chronic pain in different Australian states are summarised below (See Table 1 and 2):

Table 1: Total financial cost of chronic pain

Total financial cost		**$73.2 billion**
	Health system costs	*$12.2 billion*
	Productivity losses	*$48.3 billion*
	Other financial cost (such as informal care)	*$12.7 billion*

Table 2: Total cost expenditure by state

State		Total cost expenditure (%)
	NSW	*32*
	VIC	*25*
	QLD	*20*
	WA	*11*
	Others	*12*

Pain, worklessness and work disability:
Chronic pain may result in reduced employment. This is due to either difficulties such as searching for work or keeping a job due to frequent absences or self-selection out of the labour force. This can lead to significant productivity losses in the form of lost wages and other costs to the individual with pain. A study from UK reported that one in every eight unemployed people in the UK state that their unemployment was due to back pain (*Turk 2002*).

A recent report published by Deloitte Access Economics concluded that reduced employment associated with chronic pain was estimated to cost $36.2 billion in 2018, or $16,338 per working age Australian living with chronic pain (*Deloitte Economic Access 2019*).

The findings of the report are summarised in table 3 to 5.

Table 3 Employment status for people with and without chronic pain (adapted *Deloitte Access Economics 2019, p42*).

Source	Chronic pain (%)			No chronic pain (%)		
	FT	**PT**	**Total**	**FT**	**PT**	**Total**
ABS 2016	33	21	54	52	25	77
Blyth 2001	31	12	42	43	13	56
McNamee 2014	-	-	32	-	-	67
Langley 2010	35	6	40	45	6	51
Average	33	13	42	46	15	63
FT = employed full time; PT = employed part time; Total = employed full time or part time.						

Table 4 Absenteeism due to chronic pain (adapted *Deloitte Access Economics 2019, p44*).

Study	Days lost per year
Blyth 2003	*9 days*
Langley 2010	*2 days*
Kawai 2017	*5 days*
Stewart 2003	*8 days*
Average	9 days

Note: Absenteeism refers to temporarily absent from paid employment due to their pain. Absenteeism is measured as the average number of days per year that an employee takes off work as a result of their chronic pain. On average, Australians with chronic pain were estimated to be absent from work for an additional 9 days per year compared to people without chronic pain.

Table 5 Presenteeism due to chronic pain (adapted *Deloitte Access Economics 2019, p46*).

Study	Days lost per year
Blyth 2003	*24 days*
Kawai 2017	*20 days*
Langley 2010	*28 days*
Stewart 2003	*29 days*
Average	**25 days**

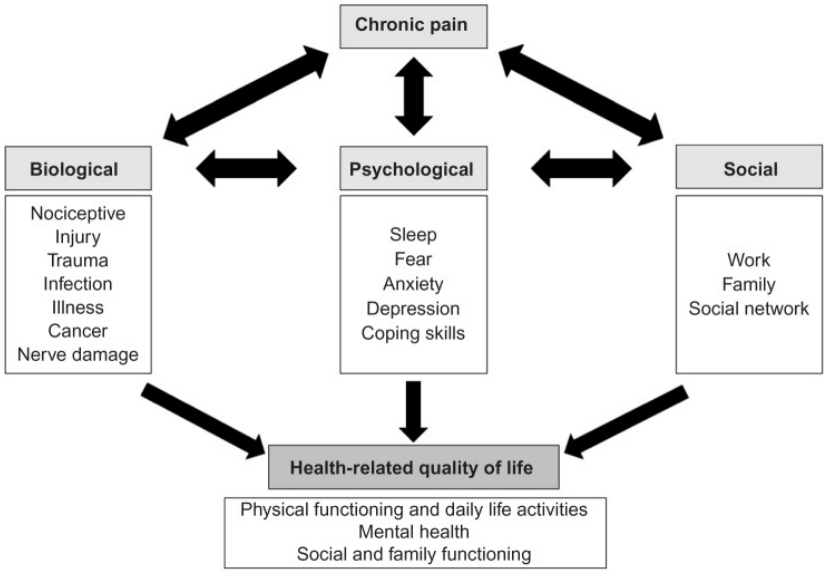
Note: Presenteeism refers to reduced productivity while an employee is at work but suffering from pain. Presenteeism is measured as the average number of hours per day (calculated for year) that an employee loses to reduced performance or impaired function as the result of their condition.

Impact of pain on quality of life

The experience of pain interferes with different aspects of the patient's life (*Langley 2011*), negatively affecting their daily activities, physical and mental health, family and social relationships, and their interactions in the workplace. This ultimately impacts health-related quality of life. This also affects the health care system, well-being (*Langley 2011*) and results in loss of productivity and from compensatory payments to patients as a result of the disability that pain produces (*Dansie 2013*).

The biopsychosocial model (Figure 1), considered essential in pain, provides a framework for understanding how different diseases are related through an assessment of sensory, cognitive/affective, and interpersonal factors. Thus, considering this framework, it has been shown that chronic pain is often associated with other processes that, in turn, affect pain strongly (*Scott 2007*).

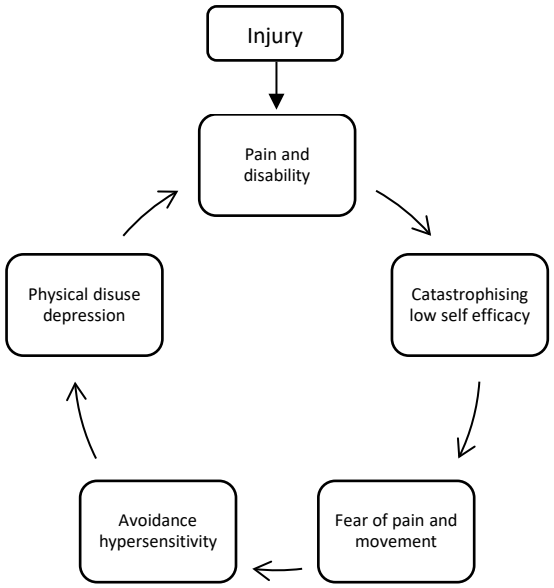
Figure 1 Biopsychosocial model of pain and consequences on the quality of life
Adapted from Jensen 2011.



Chronic pain and psychosocial influences

Chronic pain is a product of a complex relationship between biological, psychological, social, political and cultural factors (*Gatchel 2007*). The biopsychosocial model provides an ideal framework for understanding pain-related disability (*Jensen 2011*). Another model that expands the multifactorial influence of psychosocial factors on chronic pain is the Fear-avoidance Model shown in Figure 2 (*Vlaeyen 2000*). The fear-avoidance model postulates that pain related fear triggers escape behaviours, leading to avoidance of adaptive strategies, such as paced activity or social interaction (*Zale 2015*). While being careful and resting is appropriate when newly injured and having acute pain, continuing to avoid physical and social activity will eventually diminish daily functional status (e.g. reduced social participation and increased depressive mood), and likely to lead to increased disability (*Zale 2015*). Prospective research has confirmed that the importance of pain-related fear in chronic pain, revealing for instance, that persons with low back pain who remain inactive experience greater levels of disability over time (*Pinto 2014*). The model also argues that avoidance behaviour in the short-term (thus reducing fear in the short-term) will likely lead to increased fears of re-injury or pain in the long-term (*Zale 2015*).

Figure 2: A maladaptive cycle predicted by the Fear Avoidance Model of Chronic pain.
Source Vlaeyen 2000



Impact of pain on sleep:

Chronic pain and sleep problems seem to go hand in hand (*Sivertsen 2015*). Frequently people with chronic pain find it difficult to fall asleep, or sleep is often disrupted with long night awakenings (*Kelly 2011*). Even if you get a good amount of sleep, you can still feel very tired in the morning as the quality of sleep is often poor. Because of this, it is common for people to want to address sleep as part of pain management. There is a reciprocal relationship where pain during the day affects the quality of that night's sleep and poor-quality sleep increases pain levels the next day (*Kelly 2011*).

Question 3: What interventions are effective in pain management? What works to reduce these harms/impacts?

The management of chronic pain generally requires a broad whole person treatment approach which addresses the multiple aspects of pain and lifestyle. "Active self-management" is a key component, along with targeted medical input and appropriate social support. The focus is on making gradual change and assessing response. The aim in chronic pain is to "retrain the brain". Pain reduction usually happens slowly over a 6 to 12 month period, although at times rapid improvement can occur. The following is an overview of various treatment for chronic pain (based on pain pathways for managing chronic pain). It is recommended to carefully weigh up the evidence before you commence any intervention for chronic pain. This includes consideration of possible side effects that might arise. Interestingly, one of the most reliable findings in the pain management field is that patients being treated for a given problem under a workers' compensation scheme have poorer outcomes than those being treated for the same problem in a non-compensation environment (*Teasell R 2001; Lysgaard 2005*).

There is evidence for a range of interventions for different pain conditions and different stages (acute, sub-acute and chronic). Note that chronic pain may be termed persistent pain (*Treede 2015*). It is important to manage acute pain appropriately and not start opioids in the acute phase in many cases. The implementation of such interventions in routine clinical practice requires timely access for those in pain, as well as health care providers who are skilled in the provision of appropriate treatment options. Commonly used interventions for managing pain are stated subsequently and are adapted from ACI Pain Management Network (*ACI 2019*).

A. Biomedical

This can include surgery, nerve blocks and medication. There are also more invasive medical procedures such as implantable intrathecal drug delivery systems and spinal cord and peripheral nerve stimulators. Overall the evidence for medical interventions in chronic pain is weak. Commonly used medications include, anti-inflammatory analgesics, paracetamol, antidepressants, anticonvulsants and opioids. It could also include pharmacological treatment for depression and anxiety.

<u>Medications commonly used for the treatment of pain</u>

Simple analgesics

- Paracetamol
- Anti-inflammatories e.g. celecoxib (Celebrex), ibuprofen (Brufen, Nurofen), diclofenac (Voltaren), indomethacin (Indocid), meloxicam (Mobic), naproxen (Naprosyn), ketoprofen (Orudis)

Anti-neuropathic

These medications work on nerve pain. Anti-neuropathic pain medications might include: anti-epileptic agents

- pregabalin (Lyrica)
- gabapentin (Neurontin)
- valproate (Epilim)
- carbamazepine (Tegretol)
- oxcarbazepine (Trileptal)
- topiramate (Topamax)

Anti-depressant

- Tricyclic antidepressants like amitriptyline (Endep) and nortriptyline (Allegron).
- Serotonin-noradrenaline reuptake inhibitor antidepressants like duloxetine (Cymbalta), venlafaxine (Efexor) and desvenlafaxine (Pristiq).

Muscle relaxants

- Orphenadrine (Norflex)
- Baclofen
- Benzodiazepines eg diazepam (Valium)

Opioids

It is also far safer to use non-opioid pain medications in chronic pain because opioid medications may not help reduce the pain and carry serious risks. Hegmann and colleagues summarised the substantial increase in the use of opioids and the increase in deaths associated with opioids (*Hegmann 2014*). Abuse of opioids may be related to multiple prescriptions/'double-doctoring', requesting early refills, and drug diversion. A consensus is emerging that long-term opioid therapy for chronic non cancer pain may be appropriate only for well-selected populations (*Manchikanti 2012*). Furthermore, agreement is building that high-dose opioid treatment should be used with extreme caution for indications other than cancer pain.

Opioid medications include:

Weak Opioids	***Strong Opioids***
Codeine	Morphine
Tramadol	Oxycodone
Tapentadol	Hydromorphone
Buprenorphine patch	Fentanyl patch
	Methadone

All opioids are not same. They differ in their clinical range of effect. Overall, there is no difference in harms between strong and weak opioids use (Leppert 2011).

Cannabinoids

Some people report that recreational drug use with marijuana relieves neuropathic pain. Studies examining the effectiveness of cannabinoids have found a modest effect in people with multiple sclerosis (*Rog 2005*), a small effect in peripheral neuropathic pain (*Selvarajah 2010*), and a significant reduction in pain with central and peripheral neuropathic pain (*Wilsey 2013*).

A Cochrane review of 16 studies concluded that there is no high-quality evidence suggesting that cannabis-based products including herbal cannabis (marijuana) are of value in treating people with chronic neuropathic pain. Cannabis-based medicines are no first-line treatment of any condition with chronic neuropathic pain and this needs to be explained to people requesting this treatment. In the absence of high-quality evidence of benefit, the use of cannabis-based medicines at the discretion of a pain specialist with particular expertise in use of cannabis-based medicines is desirable (*Mücke 2018*).

Interestingly, another systematic review of 18 studies concluded that cannabinoid drugs may prevent the onset of pain by producing small increases in pain thresholds but may not reduce the

intensity of experimental pain already being experienced; instead, cannabinoids may make experimental pain feel less unpleasant and more tolerable, suggesting an influence on affective processes (*De Vita 2018*).

Topical medication

Sometimes pain medications are creams or ointments that can be applied to areas of the body that cause chronic pain. This is an example of off-label use of pain medications. They work very well for some people and have very few, if any side effects. Medications that can be made into creams include ketamine, gabapentin, amitriptyline, clonidine, and lignocaine. There are topical patches that work well for nerve pain: capsaicin (Qutenza) and lignocaine (Versatis).

An overview of Cochrane reviews undertaken in 2017 concluded that there is good evidence that some formulations of topical medications, such as diclofenac and ketoprofen are useful in acute pain conditions such as sprains or strains. In addition, the exact formulation used is critically important in acute conditions, and that might also apply to other pain conditions (*Derry 2017*).

A number of medications have proven effective in chronic pain disorders and their use individually or in combination may improve the management of chronic pain (Kroenke 2009). See Table 6 for evidence-based medication algorithm for chronic pain.

Table 6: Evidence-based medication algorithm for chronic pain (Kroenke 2009 pp 214) with modifications for Australia.

Type of pain	Medication
Most pain	*Paracetamol (Acetaminophen)* 650–1000 mg 6h (maximum of 2000mg/day if cirrhosis or ≥3 alcoholic drinks/day). *NSAIDS* (try at least 2 different ones before considering class failure) • Naproxen 500 mg 12h, or 500 mg in a.m. and then 250 twice daily (max 1000 mg/day) • Ibuprofen 600 mg 6h (max 2400 mg/day) • Diclofenac 50 mg 8h (max 150 mg) ***Comment***: All NSAIDs appear equally effective as analgesics. While GI adverse effects have traditionally been considered the most common and worrisome complication, cardiovascular risk has gained increasing attention. Naproxen has the safest cardiovascular profile.
Neuropathic **Fibromyalgia** **Low back**	*Tricyclic antidepressant* • *Amitriptyline*, start at 10–25, titrate to 100 mg • *Nortriptyline*, start at 10–25, titrate to 100 mg ***Comment***: Do not exceed 50 mg if on Serotonin- Norepinephrine Reuptake Inhibitors or Selective Serotonin Reuptake Inhibitors. Relatively contraindicated in older people or cardiovascular disease.
Neuropathic **Fibromyalgia** **Osteoarthritis**	*Tramadol*: start 25 mg BID or TID; titrate to max of 100 mg Q. ***Comment***: Can be combined with paracetamol. Lower maximum daily doses inpatients >75 years (300 mg), renal insufficiency (200 mg) or cirrhosis (100 mg)
Neuropathic	• *Gabapentin* begin 100 mg TID; titrate up to 900–1200 mg TID.

	• *Duloxetine* 60 mg daily. • *Pregabalin* 300-450 mg daily in divided doses.
Fibromyalgia	• *Pregabalin* 300-450 mg daily in divided doses • *Duloxetine* 60 mg daily
Neuropathic Osteoarthritis	*Topical creams* • *Capsaicin cream* 0.025% 4 times per day over painful area • *Lidocaine* 5% patch (max 3 patches) ***Comment***: Local skin irritation can limit use. Less practical if pain not localised. Benefits are modest.
Opioids	• *Codeine* 30mg (often combined with paracetamol) • *Oxycodone* ***Comment***: Codeine is lower scheduled and easier to refill. Oxycodone sustained release and fentanyl patch are not encouraged in view of their adverse risk profile. Short-acting opioids should be used first to determine dosing and side effects.

People with chronic pain should not rely solely on pain medications or medical procedures for relief from their pain. Recommendations for medication use in chronic or persistent pain have changed as a result of scientific research. Chronic pain research shows that the greatest pain reduction comes from using a whole person approach to management and that in many situations it is possible to use medication for a time limited phase and then wean and cease it as active self-management skills come into play (*ACI 2019*).

B. Psychological Treatments

Psychosocial approaches to pain management rely heavily on self-management strategies that the person can use to reduce their pain and improve their mood and resilience.

According to *Jensen (2011)*, there are five key psychosocial factors that influence pain, and which should be targets for pain management programs. These are:

1. Environmental factors that include helpful social support (adaptive) or lack of social support/unhelpful support (maladaptive). These factors will have a major impact on pain management outcomes and will influence the other psychosocial factors in the framework.
2. The person's state of mind (brain state) that will facilitate being responsive to suggestions and direction or being able to attain a state of relaxation and calmness, and an ability to increase their pain threshold/tolerance.
3. Cognitive content that is, the person's beliefs and expectations will influence the other psychosocial factors and will directly influence pain and its management.
4. Cognitive coping, meaning the extent to which the person uses helpful cognitive strategies like acceptance of pain, distraction, optimism, pleasant memories, ignoring pain (all adaptive) or uses unhelpful strategies.
5. Behaviour, for example, helpful behaviour might include keeping active physically and socially using a pacing approach.

The Fear-avoidance Model has led to the introduction of important components into Cognitive Behavioural Therapy (CBT) pain management programs, such as graded exposure procedures, including adaptive coping strategies. CBT helps patients to address patterns of thinking and behaviour. There is a focus on goal setting development and planning with much emphasis on an accurate understanding of pain and its relationships. Lifestyle changes and strategies are

encouraged to improve sleep patterns and to develop better coping skills for pain and other stressors using various techniques. Such a program has been shown to decrease levels of pain-related fear and improve functioning in persons with chronic low-back pain (*Trost 2014*). Additional research has shown efficacy for similar programs with persons with injury and chronic pain (*Zale 2015*).

An exhaustive Cochrane review of psychological treatments for chronic pain was published in 2012 (*Williams 2012*). The review examined the efficacy of psychological therapy (CBT) in 35 trials that met quality criteria. The focus of treatments was to help people change behaviours that maintain or worsen chronic pain, disability, distress and catastrophic thinking. Studies included measures of pain, disability, mood and catastrophic thinking assessed before, immediately after, and six months post-treatment. The investigators concluded that CBT produced mild benefits in areas such as disability, mood and negative/catastrophic thinking, but less so for measures of pain (*Williams 2012*). Williams and colleagues concluded that CBT pain management can help people with chronic pain improve mood, cope better with disability, and reduce catastrophising styles of thinking, as well as provide some benefit for pain.

C. Physical Therapy (passive and active therapies)

This therapy may be guided by a physiotherapist, exercise physiologist, occupational therapist or other health professional. Hands on therapy has a role in acute pain management. The focus in chronic pain is active self-management. Here the therapist facilitates an activity or exercise program. This could include a progressive program of range of motion therapy, muscle strengthening and postural training. Any therapy utilised will also include promoting active self-management strategies to increase an individual's ability to work and function, perform household duties and simply enjoy life.

Although physical and manual therapies are widely used in the treatment of musculoskeletal pain problems, there is continuing debate about their long-term effectiveness. There is stronger evidence for some approaches:

- Spinal manipulation and neck exercises have a positive effect on cervicogenic headache (*Jull 2002*).
- Physiotherapist-directed exercise and advice have significant beneficial effects on pain and function in people with sub-acute low back pain at 6 weeks but with only a small effect on function at 12 months (*Pengel 2007*).
- Massage has a positive effect in low back pain that is maintained for at least 12 months (*Cherkin 2001*).
- Heat is effective for the relief of acute low back pain (*Chou 2007*).
- Exercise, spinal manipulation and interdisciplinary rehabilitation are effective for chronic and subacute low back pain (*Chou 2007*).
- Physical conditioning programs that include a cognitive behavioural approach plus intensive physical training are effective in reducing disability associated with chronic back pain (*Schonstein 2007*).

Other therapies, such as transcutaneous electrical nerve stimulation (TENS), peripheral nerve stimulation. acupuncture, spinal cord stimulation, deep brain stimulation and motor cortex stimulation may be beneficial in some people. Although many of these therapies/techniques are widely used, the evidence for all of these approaches is limited. Although many studies do not provide long-term outcomes, there is evidence high-frequency TENS is effective for managing

osteoarthritic knee pain (*Bjordal 2007*), low-level laser therapy for treatment of chronic neck pain and osteoarthritic knee pain (*Chow 2006*).

D. Complementary Alternative Medical (CAM) Therapies

CAM refers to forms of health care that are used in addition (complementary) or instead of (alternative) traditional medical treatment by some people with chronic pain. These are defined as:

1. Alternate medical systems: arises from complete systems of theory and practice e.g. homeopathic and flower remedies in western cultures and traditional Chinese medicine in non-western cultures.
2. Mind-Body interventions: techniques to enhance the mind's capacity to affect the body e.g. counselling, meditation, prayer and creative therapies such as music or art therapy. These can overlap with some psychological therapies.
3. Biologically based therapies: Uses substances in nature e.g. nutritional supplements and vitamins, naturopathic nutrition and diet.
4. Manipulative body-based methods e.g. massage, acupuncture, aromatherapy chiropractic and osteopathy.
5. Energy therapies: based on use of energy fields e.g. tai chi, reiki and therapeutic touch.

The evidence in chronic pain management supports active over passive strategies and trial principles apply to CAM therapies, as it does to traditional approaches. It is important to understand that like any treatment there can be benefits and side effects. Refer to the professional body regulating practice for advice on levels of experience, qualifications, and training required by practitioners (Cancer Council 2012; NCCAM 2018).

E. Pain education

It would seem sensible that education sessions be integrated into multi-session pain management programs (*Louw 2011*) and could be delivered face-to face or to groups, or indeed, it can be delivered online in an internet program. Excellent guidelines on how and what to educate can be found in the article by Nijs 2011. There is now evidence on effectiveness of interventions involving patient education. However, person needs to commit to the pain management program and a number of people are unable to do this. A Cochrane review including 24 studies concluded that for patients with acute or subacute low back pain, intensive patient education (duration 2.5 hours) seems to be effective (Engers 2008).

F. Online interventions for pain management

In USA, a randomised controlled trial was conducted to determine the effect of an online mindfulness intervention targeting socioemotional regulation in patients with fibromyalgia (n = 79). Patients were randomly assigned to either "mindfulness intervention targeting socioemotional regulation" or "healthy lifestyle tips" group, with outcomes assessed via online diary reports of pain, coping efficacy, affect, and social relations. The study revealed greater improvements in coping efficacy for pain and stress as well as social functioning and positive affect (*Davis 2013*).

A meta-analysis including 16 studies include participant allocated to standard care (or a waitlist), active control or tailored web-based intervention.

- tailored web-based intervention versus standard care (or a waitlist): showed benefits for pain intensity and pain-related disability, favouring tailored web-based group

- tailored web-based intervention versus active controls: no improvements were found for pain intensity and other outcomes, except one.

The authors of this review also stated that tailored web-based intervention is no more efficacious than standard web-based interventions in terms of pain intensity, pain-related disability, anxiety, and depression (Martorella 2017). In the review by Martorella and Collegue (2017), two Australian studies were included (*Dear 2013 and Dear 2015*). The first study was a randomised controlled trial on clinician-guided Internet-delivered cognitive behaviour therapy program for managing chronic pain and emotional well-being (*Dear 2013)*. The study found that treatment group had significant improvements than the control group participants in levels of disability, anxiety, depression, and average pain levels at post-treatment. The study also concluded that the results of the study are better than those reported in other studies Internet-delivered cognitive behaviour therapy to date and provide support for the potential of clinician-guided Internet-delivered cognitive behaviour therapy (*Dear 2013)*.

The second study was also a randomised controlled trial determining the effect of an internet-delivered pain management program when provided with different levels of clinician support. Significant improvements in levels of disability, anxiety, depression, and pain were observed and no consistent or marked differences were found across the levels of clinician support provided (*Dear 2015)*.

There are no studies about the effectiveness of online interventions for compensable population in NSW but above findings are generalisable for people suffering with different pain type.

Implications:

- Chronic pain patients are often very complex and may have other co-morbidities and should be considered for a GP Management Plan with Team Care Arrangements. This encourages follow up care and gives the GP an opportunity to discuss a longer-term strategy of care and involve other team members where appropriate.
- Requests are made for pain interventions for people participating in insurance programs that have little or no scientific evidence of validity. It could be useful to have a mechanism to deal with contentious requests, such as a listing of approved treatments or a mechanism for review of very high cost requests.
- Opioids have time-limited roles in the treatment depending on different type of pain.
- Biomedical treatments have an important but limited success in chronic pain, active self-management and healthy lifestyle choices are fundamentals to address complexity of chronic pain.
- Treatments for managing pain should include encouraging the person to undertake pleasurable activities, relaxation and exercise based on pacing principles.
- Pain management is delivered in most cases usually provided by primary health care professionals or non-pain specialists, but often they lack training and confidence in delivering this care.
- Patients with chronic pain where no treatable cause of the pain has been identified, support for the ongoing self-management of this pain is required from the community in general. This will require public health education strategies that emphasise:
    - acceptance of the existence of chronic pain
    - recognition that the source of chronic pain is in the central nervous system
    - recognition that a healthy lifestyle is still possible despite chronic pain.

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Future research implications

1. Research on pain beyond 1 year has been limited. It is not known, for example, if the predictors of chronic pain at 3 years are the same as those for earlier time points or whether other factors become more relevant. These differences may be important in building our understanding of chronic pain and pain-related disability and will inform models developed for screening and early intervention for pain in the aftermath of serious injury.

2. Another key theme that needs further research is to explore and design a multidisciplinary pain tool for effective risk assessment and management. *NB: The project was unsuccessful in getting the funding. The project was submitted to a competitive grant round. The authors proposed to co-develop (with consumers) a digital risk stratification tool that through a guided process, assesses and advises on management/ self-management of symptoms of chronic pain.*

3. There are other factors that may influence whether compensation has an important negative effect. For example, persistent pain is one of the major predictors of return to work and anxiety/ depression. Is the magnitude of pain suffered greater in patients receiving compensation? Would better early pain control mitigate the influence of compensation? Is the anxiety surrounding medical assessment and litigation for compensation responsible for augmenting the negative impact of chronic pain? The complex interplay of these established predictors of outcome is not known.

4. The updated Canadian opioid guidelines had also come under criticism for potential financial conflicts of interest, highlighting the need for independent and unbiased summaries of the evidence such as those provided by the Cochrane Collaboration.

5. Longer-term follow-up studies are needed to determine the effectiveness of multidisciplinary pain intervention/s.

6. Although causal relationships cannot be assumed, research findings imply that aspects of loss, injustice, and secondary mental health outcomes may lead to chronic pain following MVC. Further high-quality studies are required to understand the effect of compensation systems and pain following MCV, particularly the role of secondary mental health outcomes.

7. There may be factors inherent in the compensation scheme that can worsen or improve chronic pain and examination of scheme related factors should also be considered. The prime negative examples are fault-based schemes and schemes that provide excessive treatments with inadequate focus on returning to work and usual activity.

8. Qualitative studies to explore how participants experience the intervention, for example, what aspect of the courses do participants like/dislike, why do people drop out, why is attendance low?

Appendix A

Table below summarises the objective, PICO and search strategies for this rapid review:

Objectives and research questions	• Is pain a problem for people injured at work or on the roads in NSW in compensation schemes? • What are the risks/harms of pain experienced by people in compensation schemes? (i.e. the impact of pain) • What interventions are effective in pain management? • What works to reduce these harms? • Are there differences or interventions that work in other compensable jurisdictions?
Study design	Rapid review (narrative review)
Search strategies	We included studies that were published in English language, irrespective of age and were published within last 10 years. We excluded studies with findings about illicit drugs. We planned to search evidence in the below order of preference# to identify reports of relevant studies: 1. Overview of reviews (Cochrane and non-Cochrane) 2. Systematic reviews (Cochrane and non-Cochrane) 3. National clinical guidelines *# - a more restricted rapid review process was adopted, i.e. inclusion of only systematic reviews and evidence based clinical practice guidelines due to limited time duration to undertake this review.* The following electronic searches were conducted to identify potential studies. 1. Cochrane Library (search date: 30 March 2019) *Purpose*: for searching Cochrane reviews. *Search terms*: • #1 ("chronic pain disorder"):ti,ab,kw OR (pain):ti,ab,kw OR (recovery):ti,ab,kw with Cochrane Library publication date Between Jan 2009 and Mar 2019, in Cochrane Reviews • #2 ("worker's compensation"):ti,ab,kw OR ("compensation"):ti,ab,kw with Cochrane Library publication date Between Jan 2009 and Mar 2019, in Cochrane Reviews • #3 ("motor vehicle accident"):ti,ab,kw OR ("road traffic accident"):ti,ab,kw OR (work injury):ti,ab,kw OR ("road traffic injuries"):ti,ab,kw with Cochrane Library publication date Between Jan 2009 and Mar 2019, in Cochrane Reviews, Trials • #4 ("pain management"):ti,ab,kw OR (pain intervention):ti,ab,kw OR (online

	intervention):ti,ab,kw OR (treatment):ti,ab,kw with Cochrane Library publication date Between Jan 2009 and Mar 2019, in Cochrane Reviews, Trials • #5 #1 AND #2 • #6 #1 AND #3 AND #4 • #7 #1 AND #2 AND #3 AND #4 2. Google Scholar (search date: 30 March 2019) *Purpose*: for searching reviews. *Search terms*: The **first** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] systematic reviews OR review$ OR literature; [with at exact phrase] worker's compensation OR scheme OR claim; [with at least one of the words] pain management OR pain interventions; [Return articles dated between] 2009 to 2019. The **second** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] systematic reviews OR review$ OR literature; [with at exact phrase] worker's compensation OR scheme OR claim; [with at least one of the words] pain management OR pain interventions; [Return articles dated between] 2009 to 2019. The **third** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] systematic reviews OR review$ OR literature; [with at exact phrase] worker's compensation OR scheme OR claim; [with at least one of the words] pain management OR pain interventions; [Return articles dated between] 2009 to 2019. The **fourth** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] systematic reviews OR review$ OR literature; [with at exact phrase] worker's compensation OR scheme OR claim AND 'pain management OR pain interventions'; [Return articles dated between] 2009 to 2019.

	The **fifth** Google Scholar search combined the following terms using "anywhere in the article": [with all of the words] systematic reviews OR review$ OR literature; [with at exact phrase] worker's compensation OR scheme OR claim; [with at least one of the words] compensable population; [Return articles dated between] 2009 to 2019. 3. Google Scholar (search date: 30 March 2019) *Purpose*: for searching clinical guidelines. *Search terms*: The **first** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] compensation guidelines OR polic$ OR report$; [with at least one of the words] pain management OR pain interventions; [Return articles dated between] 2009 to 2019. The **second** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] compensation clinical guidelines OR polic$ OR report$; [with at least one of the words] pain management OR pain interventions; [Return articles dated between] 2009 to 2019. The **third** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] injury OR workers compensation guidelines OR polic$ OR report$; [with at least one of the words] pain management OR pain interventions; [Return articles dated between] 2009 to 2019. The **fourth** Google Scholar search combined the following terms using "in the title of the article": [with all of the words] guidelines for compensable population OR polic$ OR report$; [with at exact phrase] pain management; [Return articles dated between] 2009 to 2019. The **fifth** Google Scholar search combined the following terms using "anywhere in the article": [with all of the words] workers compensation guidelines OR polic$ OR report$;

	[with at exact phrase] pain management OR pain interventions; [with at least one of the words] compensable population; [Return articles dated between] 2009 to 2019. 4. We also identified other potentially eligible studies or publications by searching the reference lists of retrieved studies. Please note: A few additional references have been added to the review as these are very relevant to the rapid review topic and were under final stage of publication at the time of literature search.
Population	• Adults and children • Compensable population CTP claimants or injured workers in NSW (or like populations) • All pain types (acute, sub-acute, chronic, surgical pain, recurring, neuropathic, cancer pain)
Inclusions/ exclusions	• English only • Last 10 years • Online interventions should be included
Outcomes	Summary of the evidence base to inform this priority project.