Patient-reported factors associated with degree of pain medication dependence and presence of severe dependence among spinal outpatients

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Abstract

Aims: To identify risk factors for pain medication dependence. **Methods:** Chronic spinal pain outpatients (n=106) completed the Leeds Dependence. Questionnaire (LDQ) and measures of potential risk factors. Participants with high (n=3) and low (n=3) dependence were interviewed. **Results:** Mean LDQ score was 11.52 (SD 7.35) and 15/106 participants (14.2%) were severely dependent (LDQ ≥20). In linear regression, pain intensity (β=0.313, p<0.001), being disabled by pain (β=0.355, p<0.001), borrowing pain medication (β=0.209, p=0.006), and emergency phone calls or clinic visits (β=0.169, p=0.029) were associated with degree of dependence across the range of LDQ scores. In logistic regression, pain intensity (p=0.001) and borrowing pain medication (p=0.004) increased the odds of severe dependence. Interviewees described how their pain influenced their pain medication use and one described pain medication addiction. **Conclusions:** Interventions to reduce pain intensity and pain-related disability may reduce pain medication dependence.

Lay abstract: This study examined painkiller dependence among 106 people with chronic spinal pain. Participants had mild to moderate dependence on average, but 14% (15/106) had severe dependence. Statistical analysis showed that having more intense pain, being disabled by pain, needing to borrow painkillers, and needing to make emergency phone calls or clinic visits because of pain were all related to increased dependence, and more intense pain and borrowing painkillers made severe dependence more likely. Six participants who were interviewed described how their pain influenced their painkiller use and they also described their concerns about using painkillers, including becoming addicted to painkillers. These findings can guide ways to help people with chronic spinal pain to reduce or avoid painkiller dependence.

Tweetable abstract: Evidence about risk factors for painkiller dependence among people receiving hospital treatment for chronic spinal pain.

Keywords: Spinal pain; chronic pain; pain medication; dependence; painkiller; addiction.

Introduction

Chronic back or spinal pain affects 54% to 80% of people at some point in their lives and causes significant disability, mental health problems and healthcare costs [1-4]. Prescribed pain medications contribute significantly to treatment costs [3]. Some evidence suggests that people with spinal injury are at high risk of medication misuse [5-7], but evidence is mixed about the risks for pain medication dependence, which may increase the chronicity of pain and may also be a cause of misuse and other more harmful outcomes. Dependence develops in a process and can be measured dimensionally (on a continuum) as well as by applying cut-offs to identify people with severe dependence [8, 9], so it is a useful target for interventions aiming to help people reduce their reliance on pain medication and avoid more harmful outcomes.

Studies found different rates of pain medication dependence among different chronic pain populations, although all defined pain medication dependence differently. In one, 12.6% of chronic pain patients were 'dependent on analgesics' [10]. In another, 5% of chronic back pain patients had current 'analgesic abuse or dependence' [11]. In another, 20% of spinal surgery patients were 'opioid dependent' [12]. One study found higher rates of 'drug dependence' among patients with low back pain than those with joint pain [13].

One systematic review concluded that substance use disorders were common among patients taking opioids for back pain [14] but another concluded that opioid analgesics for chronic pain were not a risk for developing dependence [15]. However, the quality of evidence about substance use disorders among people treated for chronic non-cancer pain is generally low and more research is needed to inform clinical practice in this area [16].

Because previous research defined and measured pain medication dependence in different ways and examined patient groups with different types of chronic pain, we wanted to examine both degree of dependence and presence of severe dependence among a more narrowly defined population of patients specifically diagnosed with spinal pain. The aim was to identify risk factors for degree of dependence and severe dependence.

Qualitative research can also give insights into the experiences of people taking medication for chronic pain. A synthesis of qualitative evidence concluded that people taking opioid medication for chronic pain did so reluctantly, were constantly balancing tensions, often felt stigmatised, were not always 'on the same page' as their healthcare professionals and found it challenging to reduce or withdraw their medication [17]. We therefore also conducted in-depth interviews with selected survey respondents to gain further insights into participants' experiences.

The study objectives were to:

1. Identify factors associated with degree of pain medication dependence (measured dimensionally).

2. Identify factors associated with the presence of severe dependence (measured categorically).
3. Understand participants' experiences of using pain medication.

Methods and materials

Participants

The inclusion criteria were being over 18 years old, having chronic spinal pain and using pain medication. Chronic spinal pain was defined as pain greater than 3 months duration related to the spine and associated structures. The exclusion criteria were being unable to speak English, having an additional diagnosed pain condition, or having a serious mental illness or cognitive impairment that could affect participants' ability to make reasonably accurate self-reports about their pain and medication use. The threshold for this was high and no participants were excluded because of addictions or substance use disorders.

Participants were recruited in the spinal and physiotherapy outpatient services at two UK hospitals. Interview participants were recruited from those who indicated in the survey they were willing to be interviewed.

Measures

The questionnaire collected information about demographics, duration of spinal pain, pain intensity (10-point rating scale), pain-related disability, use of prescribed and non-prescribed pain medication, and risk behaviours for pain medication misuse including: feeling addicted to pain medication, using pain medication for other problems, saving up unused pain medications, losing pain medications and needing to have them replaced, being taken off pain medication to reduce tolerance, obtaining pain medications from a different prescriber from usual, taking medications differently from how they were prescribed, taking more pain medication than prescribed, borrowing pain medication, being worried about use of pain medication, others being worried about use of pain medications, and having to make emergency phone calls or clinic visits [18, 19].

Participants also completed the Leeds Dependence Questionnaire (LDQ), a 10-item scale based on ICD-10 criteria for substance dependence. Each item is scored 0, 1, 2 or 3, and a total score is obtained by summing across all 10 items. The LDQ has good reliability and validity and can measure dependence dimensionally or by applying a cut-off of 20 points or more to identify severe dependence [8, 9, 20]. We used a version previously adapted to assess pain medication dependence by replacing the words 'drink and drugs' in each item with 'painkillers' (e.g., 'do you find yourself thinking about when you will next be able to take painkillers?') [21, 22].

Procedure

The study protocol was approved by the NHS Health Research Authority (Research Ethics Committee reference 19/NW/0031). Participants who gave informed consent prior to participation completed printed or electronic questionnaires during routine hospital outpatient visits. Participants who indicated they were willing to be interviewed were contacted to arrange audio-recorded telephone interviews that covered how participants'

use of pain medication had changed over time, factors that influenced their use of pain medication, their feelings and concerns about pain medication, and ways they would like to change their use of pain medication.

Analytic strategy

The data analysis was conducted using IBM SPSS v27. Normality of distribution of continuous measures (LDQ score, age, duration of spinal pain and pain intensity) was tested using the Kolmogorov-Smirnov statistic and non-parametric methods were used for tests of association with variables that were not normally distributed. To identify factors associated with degree of pain medication dependence, we tested associations between LDQ scores and other study measures, using Pearson's product-moment or Spearman's rho correlations for associations with continuous measures (age, duration of spinal pain, pain intensity) and independent groups t-tests or Mann-Whitney's U for associations with binary measures (gender, pain-related disability, use of each type of pain medication, and presence/absence of risk behaviours for pain medication misuse). Because there were 27 variables whose bivariate associations with dependence were tested, we adjusted the alpha value for bivariate significance testing to 0.00185 (0.05 divided by 27).

To identify factors associated with presence of severe pain medication dependence, we tested for differences between groups with LDQ scores <20 versus ≥20, using independent groups t-tests or Mann-Whitney's U for continuous measures (age, duration of spinal pain, pain intensity) and Chi-square tests for binary measures. The critical value of p was again adjusted to 0.00185 (0.05 divided by 27) to take account of multiple tests.

Multiple linear regression was then used to identify independent associations with dimensional LDQ scores. Multiple logistic regression was used to identify independent associations with severe dependence, using a binary dependent variable of LDQ score <20 versus ≥20. Predictor variables were included in the regression analyses if they were significantly associated with either of the dependent variables, in order that both regression analyses took account of the same predictor variables. The conventional ($p<0.05$) rather than the adjusted criterion for significance was used to select predictor variables for initial inclusion in the regression analyses in order that the criterion for initial entry to the regression model was the same as that for entry to subsequent models in the stepwise regression process.

Independence among the predictor variables was assessed by computing correlations among variables and assessing multicollinearity in the multiple linear regression. Multicollinearity was assessed by computing Tolerances and Variance Inflation Factors (VIFs) for all predictor variables, including those excluded from final models. Tolerances below 0.2 and VIFs greater than 10.0 indicate multicollinearity (23, pp. 224, 242).

To explore participants' experiences of pain medication use, we conducted a descriptive thematic analysis [24] of the interview transcripts.

Results

Questionnaire survey

The survey was completed by 106 people, of whom 91 (85.8%) completed a printed questionnaire and 15 (14.2%) completed an online version. There were 70 (66%) females and 36 (34%) males. Ages ranged from 23 to 88 years (mean 56.57 years). There were 97 (91.5%) from a White family background, three (2.8%) from an Asian family background, two (1.9%) from an African family background, three (2.8%) from a Caribbean family background and one (0.9%) from an African-Caribbean family background. There were 63 (59.4%) who were married, 22 (20.8%) in relationships and 21 (19.8%) single. There were 91 (85.8%) who had children. There were 34 who were retired (32.1%), 15 unemployed (14.2%) and the remainder worked in a diverse range of occupations including healthcare, education and administration.

The duration of participants' spinal pain ranged from four months to over 40 years, with a mean duration of 85.55 months; 84 (79.2%) had spinal pain for at least a year and 96 (90.6%) reported experiencing intense pain every day. Pain intensity ratings ranged from 3 to 10 (mean 7.41). Nearly two-thirds (63.2%; n=67) felt disabled by pain. LDQ scores ranged from 0 to 30 (mean 11.52). There were 15 participants (14.2%) with LDQ scores of at least 20 points. The Kolmogorov-Smirnov values were 0.75 (df 106), p=0.163 for LDQ score; 0.098 (df 106), p=0.014 for age; 0.237 (df 104), p<0.001 for months with spinal pain; and 0.156 (df 106), p<0.001 for pain intensity. These showed that LDQ scores were normally distributed but age, months with spinal pain and pain intensity were not. Non-parametric tests (Spearman's rho for correlations and Mann-Whitney's U for comparisons between groups) were therefore used to test associations with age, months with spinal pain and pain intensity.

The majority of participants (88.7%; n=94) took prescribed analgesics, most commonly weak opioids and compound medications (codeine, co-codamol, Zapain, co-dydramol and dihydrocodeine: 39.6%; n=42) and anticonvulsant medications (gabapentin, pregabalin: 38.7%; n=41). A quarter took strong opioids (buprenorphine, fentanyl, oxycodone, morphine and tramadol: 25.5%; n=27). NSAIDs (diclofenac, ibuprofen, naproxen, meloxicam) were taken by 41.5% (n=44) and paracetamol (acetaminophen) by 57.5% (n=61). Smaller numbers reported taking antidepressants (amitriptyline, duloxetine, nortriptyline, sertraline) or anti-anxiety medications (diazepam).

The most common risk behaviours for pain medication misuse were using pain medication for other problems (42.5%; n=45), saving up unused pain medications (34.9%; n=37) and taking more pain medication than prescribed (29.2%; n=31). The least common were feeling addicted to pain medication, losing pain medication and borrowing pain medication (all 5.7%; n=6).

The full results of all the bivariate tests to identify factors associated with pain medication dependence are given in Table A1 (Appendix A).

Bivariate associations with degree of dependence (dimensional LDQ scores)

Pain intensity, feeling disabled by pain and taking more pain medication than prescribed were significantly associated with degree of dependence (measured dimensionally across the range of LDQ scores) after taking account of the multiple tests. The

Spearman correlation between pain intensity and LDQ score was rho(df 104)=0.529, p<0.001. Mean LDQ scores were higher among those disabled by pain than those not [14.49 (SD=6.79) vs. 6.41 (SD=5.20), t(df 104)=6.42, p<0.001, d=6.25] and higher among those who had taken more pain medication than prescribed [16.45 (SD=5.48) vs. 9.48 (SD=7.08), t(df 104)=4.90, p<0.001, d=6.66].

There were several tests where the difference in LDQ scores was significant in conventional terms (p<0.05) but did not reach the adjusted criterion of p<0.00185. Of the associations with types of pain medication, mean LDQ scores were higher among those taking prescribed medication than those not [12.09 (SD=7.35) vs. 7.08 (SD=5.95), t(df 104)=2.26, p=0.026, d=7.2]; higher among those taking strong opioids than those not [15.19 (SD=8.31) vs. 10.27 (SD=6.60), t(df 104)=3.12, p=0.002, d=7.06]; and higher among those taking anticonvulsant medication than those not [13.32 (SD=7.90) compared with 10.38 (SD=6.81), t(df 104)=2.03, p=0.045, d=7.25].

Of the associations with risk behaviours for pain medication misuse, mean LDQ scores were higher among those who felt addicted to pain medication than those not [19.50 (SD=8.36) vs. 11.04 (SD=7.05), t(df 104)=2.83, p=0.006, d=7.12]; higher among those who had used pain medication for other problems [13.40 (SD=7.02) vs. 10.13 (SD=7.34), t(df 104)=2.31, p=0.023, d=7.21]; higher among those who had borrowed pain medication [18.17 (SD=6.80) vs. 11.12 (SD=7.22), t(df 104)=2.33, p=0.022, d=7.20]; higher among those who worried about their own pain medication use [16.62 (SD=7.30) vs. 10.81 (SD=7.11), t(104)=2.75, p=0.007, d=7.13]; higher among those where others had worried about their medication use [17.29 (SD=7.18) vs. 11.11 (SD=7.23), t(df 104)=2.19, p=0.031, d=7.22]; and higher among those who had made an emergency phone call or clinic visit [18.30 (SD=7.70) compared with 10.81 (SD=6.99), t(df 104)=3.20, p=0.002, d=7.05].

Bivariate associations with presence of severe dependence (LDQ score ≥ 20)

Mean pain intensity was significantly higher among those with LDQ scores ≥20 than those with LDQ scores <20 after taking account of multiple tests [8.87 (SD=1.30, mean rank=79.9) vs. 7.16 (SD=1.64, mean rank=49.2), Mann-Whitney's U=286.5, p<0.001]. The tests for being disabled by pain and several risk factors for pain medication misuse were significant in conventional terms (p<0.05) but not for the adjusted criterion (p<0.00185). The proportion of participants with LDQ scores ≥20 was higher among those disabled by pain than those not [20.9% (14/67) vs. 2.6% (1/39), X^2(df 1)=6.82, p=0.009]. The proportions of participants with LDQ scores ≥20 were higher among those who felt addicted to pain medication [50% (3/6) vs. 12% (12/100), X^2(df 1)=3.96, p=0.046]; higher among those who had borrowed pain medication [50% (3/6) vs. 12% (12/100), X^2(df 1)=3.96, p=0.046]; and higher among those who had made an emergency phone call or clinic visit [40% (4/10) vs. 11.5% (11/96), X(df 1)^2=3.95, p=0.047].

Multivariate analyses

The correlations among all predictor variables (those with significant associations with either of the dependent variables) are given in Table 1. These show that the highest correlation among predictor variables was 0.50 (between pain intensity and being disabled by pain).

Table 1. Correlations among variables in the regression analyses.

Predictor variables:												
1. Spinal pain intensity[1]	1.0											
2. Disabled by pain[2]	0.50***	1.0										
3. Prescribed pain medication[2]	0.16	0.16	1.0									
4. Strong opioid[2]	0.33***	0.27**	0.21*	1.0								
5. Anticonvulsant medication[2]	0.36***	0.16	0.28**	0.34**	1.0							
6. Felt addicted to pain medication[2]	0.23*	0.19	0.09	0.14	0.06	1.0						
7. Used pain medication for other problems[2]	0.20*	0.18	0.13	-0.02	0.10	0.12	1.0					
8. Taken more medication than prescribed[2]	0.35***	0.36***	0.23*	0.24*	0.13	0.11	0.37***	1.0				
9. Borrowed pain medication[2]	-0.10	0.02	0.09	0.04	-0.03	0.12	0.12	0.20*	1.0			
10. Worried about own use[2]	0.22*	0.17	0.04	0.05	-0.06	0.41***	0.20*	0.20*	0.16	1.0		
11. Others worried about use[2]	0.21*	0.12	0.10	0.11	0.02	0.10	-0.08	0.25*	0.10	0.36***	1.0	
12. Emergency phone call or clinic visit[2]	0.25*	0.11	0.12	0.18	0.08	-0.08	0.05	0.36***	0.06	-0.02	0.04	1.0
Dependent variables:												
13. Degree of pain medication dependence[3]	0.53***	0.53***	0.22*	0.29**	0.20*	0.27**	0.22*	0.43***	0.22*	0.26**	0.21*	0.30**
14. Presence of severe dependence[4]	0.35***	0.25**	0.06	0.20*	0.18	0.25**	0.09	0.22*	0.25**	0.18	0.11	0.24*
	1	2	3	4	5	6	7	8	9	10	11	12

Notes to Table 1:
1. 10-point rating scale
2. Coded 0=no, 1=yes
3. Dimensional LDQ score
4. Coded 0=LDQ<20, 1= LDQ≥20

Spearman's rho was used for correlations between continuous variables (pain intensity and LDQ score). Point-biserial correlations were used for correlations between continuous and categorical variables. Phi was used for correlations between categorical variables.

* $p <= .05$; ** $p <= .01$; *** $p <= .001$

In the linear regression analysis, the F ratio for the final model was 20.80 (df 4, 101; p<0.001), indicating a good fit, and the Durbin-Watson statistic was 1.974, indicating independence of errors. The lowest Tolerance was 0.644 and the highest Variance Inflation Factor was 1.395, indicating no multicollinearity. Table 2 shows the standardised regression coefficients for predictor variables included in the final model. Feeling disabled by pain, greater pain intensity, borrowing pain medication, and making an emergency phone call or clinic visit were all independently associated with pain medication dependence. Those factors accounted for just under half the variance in LDQ scores (final model R^2=0.452, adjusted R^2=0.430). Taking prescribed pain medication, taking strong opioids, taking anticonvulsive medication, feeling addicted to pain medication, using pain medication for other problems, taking more pain medication than prescribed, worrying about one's own use of pain medication and others being worried about one's use were not independently associated with dependence.

Table 2. Associations with degree of pain medication dependence (dimensional LDQ score)

Predictor variable	β	*p*
Disabled by spinal pain	0.355	<0.001
Spinal pain intensity	0.313	<0.001
Borrowed pain medication	0.209	0.006
Emergency phone call or clinic visit	0.169	0.029

Notes to Table 2:
β=standardised regression coefficient. LDQ=Leeds Dependence Questionnaire. The table shows standardised regression coefficients for predictor variables included in the final model of linear regression analyses with dimensional LDQ score as the dependent variable. Predictor variables with significant bivariate associations with the dependent variable were added to the model using the stepwise method. The criteria for entry and removal were $p<0.05$ and $p>0.10$ respectively. Only predictor variables that were included in the final model are shown in the table.

Table 3 shows the results of the binary logistic regression analyses. This showed that pain intensity and borrowing pain medication were the only factors that were independently associated with having LDQ scores of at least 20. Feeling disabled by spinal pain and making an emergency phone call or clinic visit were not independently predictive. The model correctly classified 84.9% of cases. Greater pain intensity more than doubled the odds of having an LDQ score of 20 or more for each 1-point increase in the 10-point rating scale and borrowing pain medication from someone else increased the odds by over 20 times.

Table 3. Associations with presence of severe pain medication dependence (LDQ score ≥ 20)

Predictor variable	Odds ratio (95% CIs)	df	*p*
Pain intensity	2.855 (1.562–5.219)	1	0.001
Borrowed pain medication	20.579 (2.593–163.349)	1	0.004

Notes to Table 3:
LDQ=Leeds Dependence Questionnaire. CI=confidence interval. The table shows odds ratios for predictor variables included in the final model of logistic regression analyses with categorical LDQ score (< 20 versus ≥ 20) as the dependent variable. Predictor variables with significant bivariate associations with the dependent variable were added to the model using the forward conditional method. The criteria for entry and removal were $p<0.05$ and $p>0.10$ respectively. Only predictor variables that were included in the final model are shown in the table.

Semi-structured interviews

Interviews were conducted with six consenting participants: three with LDQ scores above or close to the 20-point cut-off and three with much lower scores. Information about the interview participants and results of the analysis of interview transcripts is given in Appendix B. To summarise very briefly, the thematic analysis resulted in two key themes: 1) reasons for pain medication and 2) concerns about pain medication. In the first, participants' reasons for using pain medication included wanting to be more active and mobile, to reduce anxiety or depression, or to follow medical advice, but the most central and most important reason was pain. In the second theme, participants' concerns about pain medication included concerns about opioids, reactions to overdoses, and preferences for alternative methods of pain control. One participant described an addiction to pain medication, having recognised the signs of addiction and taken action to change his use of pain medication.

Discussion

The mean LDQ score of 11.52 indicated that most participants had mild to moderate pain medication dependence. Fourteen percent of the sample had severe dependence. This is the first evidence to our knowledge about pain medication dependence measured with the LDQ among a clinical sample with chronic spinal pain. LDQ scores in the present sample were much higher than for people with chronic pain in the general population [21, 22] but much lower than for opiate users in treatment for addictions [20, 25]. They were very close to those in samples with chronic daily headache, where the mean LDQ score was 11.58 [26], and medication overuse headache, where the mean LDQ scores for two groups before treatment were 11.9 and 12.8 [27]. By comparison with rates of dependence assessed by clinical interview, the present rate of 14% with severe dependence is close to the 12.6% of chronic pain patients assessed to be currently dependent on analgesics [10] and fell between the 5% of chronic back pain patients assessed to have current analgesic abuse or dependence [11] and the 20% of spine surgery patients assessed as opioid dependent [12].

Greater pain intensity, being disabled by pain, borrowing pain medication, and having to make an emergency phone call or clinic visit were independently associated with

degree of pain medication dependence, and pain intensity and borrowing pain medication were independently associated with presence of severe dependence. The effects of pain intensity and disability are consistent with other research; pain intensity was associated with opioid dependency assessed by clinical interview among spine surgery patients [12] and disability was associated with severity of drug dependence assessed by questionnaire among people with chronic pain [13]. The fact that pain intensity and borrowing pain medication were independently predictive in both analyses suggests they are reliable influences on pain medication dependence. In the linear regression, the R^2 value (0.452) indicated a medium-to-large effect. In the logistic regression, the odds of severe dependence more than doubled for each 1-point increase in the 10-point pain intensity rating scale and increased over 20-fold by having borrowed pain medication.

Opioid pain medications and behaviours usually interpreted as medication misuse (such as taking more pain medication than prescribed) were not independently predictive of dependence, which seems to show that those behaviours are not useful indicators of dependence, at least among hospital patients being treated for chronic spinal pain. Taking more pain medication than prescribed had a significant bivariate association with degree of dependence but was not independently associated with dependence in the regression analyses. Differences between the results of the bivariate and multivariate analyses probably reflect differences between predictor variables in how independent of one another their associations with dependence were. For example, taking more medication that prescribed was significantly correlated with pain intensity, feeling disabled by pain, and making an emergency phone call or clinic visit. It seems likely therefore that taking more medication than prescribed was associated with degree of dependence *because of* its association with those factors, which was why it was not a significant predictor in the linear regression analysis.

Post-hoc Sobel tests [28] of mediation effects using the SPSS macro provided by Preacher and Hayes [29] did show, in fact, that the effect of taking more pain medication than prescribed on degree of dependence was significantly mediated by pain intensity (Sobel=2.41, 95% CIs 0.84 to 3.98, p=0.0027) and feeling disabled by pain (Sobel=2.52, 95% CIs 0.92 to 4.11, p=0.0021) but not making an emergency phone call or clinic visit (Sobel=0.91, 95% CIs -0.29 to 2.11, p=0.14).

The findings could be applied to help guide the identification of people who could benefit from interventions to avoid or reduce pain medication dependence. For example, asking patients whether they have ever borrowed pain medication from someone else, or had to make an emergency phone call or clinic visit because of their pain, could help to identify people at risk, as well as asking them about how intense and disabling they find their pain.

The findings also suggest that treatments to reduce pain intensity and psycho-educational interventions to reduce pain-related disability may be useful for addressing pain medication dependence in this patient population. Acceptance and commitment therapy (ACT) was used to reduce pain intensity among patients with chronic pain [30] and a self-compassion intervention reduced pain medication use and dependence among people with chronic pain [31]. Mindfulness meditation has also been used to reduce pain and pain-related drug use among people with chronic pain [32-35] Exercise has also been shown to

be effective in reducing pain among people with chronic pain [36, 37]. These types of intervention have been evaluated mainly among samples with chronic pain conditions generally, but not to our knowledge specifically with spinal pain patients. The present findings support the possibility of integrating such interventions into treatment programmes for spinal pain patients.

More factors were independently predictive of the dimensional measure of dependence, which probably reflects the greater variability in the dimensional measure, including at lower levels of dependence. However, the linear regression model accounted for under half (45.2%) of the variance in pain medication dependence, so factors not included in the present study might help to explain more variability in dependence. For example, one study showed that depressive symptoms and anxious and impulsive personality traits predicted pain medication misuse among people with spinal cord injuries [5].

There was considerable convergence between the questionnaire and interview data, as the questionnaire data showed that pain intensity was a key influence on dependence and the interview participants described their use of pain medications predominantly in terms of their pain. The convergence reinforces the importance of experiences of pain in people's use of pain medication.

The study participants were all in current treatment and were mostly using prescribed pain medication, so the findings may not be representative of analgesic users in the general population who are less engaged with medical services, and they may also not be representative of people with other types of chronic pain. Other limitations include the fact that predictor and outcome variables were assessed cross-sectionally, so we cannot be sure of the direction of causation in observed associations, and the fact that all the information about participants' medication use was self-reported. Future research could examine other factors that might help to explain more variance in dependence and could also examine pain medication dependence longitudinally to understand better the development of dependence. It is also possible or even likely that the effects of risk factors for pain medication dependence interact. We did not test interaction effects in the present study because of the very large number of potential interactions, but interaction effects might be examined in future research.

Conclusions

More intense pain and borrowing pain medication were associated with both the degree of pain medication dependence and the presence of severe dependence, whereas use of opioid medications and behaviours usually interpreted as medication misuse did not predict dependence. Participants' own descriptions gave insights into how their pain affected their pain medication use, including a description of pain medication addiction.

Summary points

- People with back or spinal pain are potentially at risk for developing dependence on pain medication, but there is mixed evidence about rates and risk factors.
- In this study of 106 spinal outpatients, the Leeds Dependence Questionnaire (LDQ) was used to assess pain medication dependence.

- The degree of pain medication dependence was assessed dimensionally across the range of LDQ scores, and severe dependence was assessed categorically, by identifying participants with LDQ scores of 20 or more.
- The mean LDQ score was 11.52 (SD 7.35) and 15/106 participants (14.2%) were severely dependent (LDQ ≥20).
- Multiple linear regression showed that being disabled by pain, pain intensity, borrowing pain medication, and emergency phone calls or clinic visits were all independently associated with degree of pain medication dependence, whereas logistic regression showed that only pain intensity and borrowing pain medication were independently associated with severe pain medication dependence.
- Conventionally accepted risk factors for addictive pain medication use, such as taking opioid pain medication and taking more pain medication than prescribed, were not independently associated with pain medication dependence.
- Interview participants described how pain influenced their medication use, including a description of addiction to pain medication.
- The findings suggest that treatments to reduce pain intensity and psycho-educational interventions to reduce pain-related disability may help to reduce risk of pain medication dependence among this patient population.

Supplementary Information

1. Appendix A: Table A1.
2. Appendix B: Tables B1 and B2.

Author contributions

JE, RK and AHB conceived and designed the study. RK collected the questionnaire data and conducted the preliminary analysis of questionnaire data. JE conducted the interviews, analysed the interview data, finalised the questionnaire data analysis and drafted the manuscript. All the authors contributed to interpreting the results and writing the manuscript and all the authors approved the submitted manuscript.

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Ethical conduct of research

The study protocol was approved by the NHS Health Research Authority (Research Ethics Committee reference 19/NW/0031), and all participants gave informed consent.

References

1. Andersson GB. Epidemiological features of chronic low-back pain. *Lancet*. 354(9178), 581–585 (1999).
2. Hong J, Reed C, Novick D, Happich M. Costs associated with treatment of chronic low back pain: an analysis of the UK General Practice Research Database. *Spine*. 38, 75–82 (2013).
3. Manchikanti L, Singh V, Datta S, Cohen SP, Hirsch JA. Comprehensive review of epidemiology, scope, and impact of spinal pain. *Pain Physician*. 12, E35–70 (2009).
4. Stubbs B, Koyanagi A, Thompson T *et al*. The epidemiology of back pain and its relationship with depression, psychosis, anxiety, sleep disturbances, and stress sensitivity: data from 43 low-and middle-income countries. *Gen. Hosp. Psychiatry*. 43, 63–70 (2016).
5. Clark JM, Cao Y, Krause JS. Risk of pain medication misuse after spinal cord injury: the role of substance use, personality, and depression. *J. Pain*. 18, 166–177 (2017).
6. Heinemann AW, McGraw TE, Brandt MJ, Roth E, Dell'Oliver C. Prescription medication misuse among persons with spinal cord injuries. *Int. J. Addict*. 27, 301–316 (1992).
7. Krause JS, Clark JMR, Saunders LL. Pain medication misuse among participants with spinal cord injury. *Spinal Cord*. 53, 630–635 (2015).
8. Raistrick D, Bradshaw J, Tober G, Weiner J, Allison J, Healey C. Development of the Leeds Dependence Questionnaire (LDQ): a questionnaire to measure alcohol and opiate dependence in the context of a treatment evaluation package. *Addiction*. 89, 563–572 (1994).
9. Raistrick D, Tober G, Sweetman J, Unsworth S, Crosby H, Evans T. Measuring clinically significant outcomes–LDQ, CORE-10 and SSQ as dimension measures of addiction. *Psychiatr. Bull*. 38, 112–115 (2014).
10. Hoffmann NG, Olofsson O, Salen B, Wickstrom L. Prevalence of abuse and dependency in chronic pain patients. *Int. J. Addict.* 30, 919–927 (1995).
11. Brown RL, Patterson JJ, Rounds LA, Papasouliotis O. Substance abuse among patients with chronic back pain. *J. Fam. Pract. 43*(2), 152–160 (1996).
12. Walid MS, Hyer L, Ajjan M, Barth AC, Robinson Jr JS. Prevalence of opioid dependence in spine surgery patients and correlation with length of stay. *J. Opioid Manag.* 3, 127–132 (2007).
13. Tetsunaga T, Tetsunaga T, Nishida K, Kanzaki H, Misawa H, Takigawa T, Shiozaki Y, Ozaki T. Drug dependence in patients with chronic pain: a retrospective study. *Medicine.* 97 (4), e12748 (2018).
14. Martell BA, o'Connor PG, Kerns RD, Becker WC, Morales KH, Kosten TR, Fiellin DA. Systematic review: opioid treatment for chronic back pain: prevalence, efficacy, and association with addiction. *Ann. Intern. Med. 146*, 116–127 (2007).
15. Minozzi S, Amato L, Davoli M. Development of dependence following treatment with opioid analgesics for pain relief: a systematic review. *Addiction.* 108, 688–698 (2013).
16. Morasco BJ, Gritzner S, Lewis L, Oldham R, Turk DC, Dobscha SK. Systematic review of prevalence, correlates, and treatment outcomes for chronic non-cancer pain in patients with comorbid substance use disorder. *Pain.* 152, 488–497 (2011).

17. Nichols VP, Toye F, Eldabe S, Sandhu HK, Underwood M, Seers K. Experiences of people taking opioid medication for chronic non-malignant pain: A qualitative evidence synthesis using meta-ethnography. *BMJ Open*. 10(2), e032988 (2020).
18. Butler SF, Budman SH, Fernandez KC *et al*. Development and validation of the current opioid misuse measure. *Pain*. 130, 144–156 (2007).
19. Compton PA, Wu SM, Schieffer B, Pham Q, Naliboff BD. Introduction of a self-report version of the Prescription Drug Use Questionnaire and relationship to medication agreement noncompliance. *J. Pain. Symptom Manage*. 36, 383–395 (2008).
20. Kelly JF, Magill M, Slaymaker V, Kahler C. Psychometric validation of the Leeds Dependence Questionnaire (LDQ) in a young adult clinical sample. *Addict. Behav*. 35, 331–336 (2010).
21. Elander J, Duarte J, Maratos FA, Gilbert P. Predictors of painkiller dependence among people with pain in the general population. *Pain Med*. 15, 613–624 (2014).
22. Said O, Elander J, Maratos FA. An international study of analgesic dependence among people with pain in the general population. *Subst. Use Misuse*. 54, 1319–1331 (2019).
23. Field AP. *Discovering Statistics Using SPSS (3rd Ed.)*. Sage, London, UK (2009).
24. Braun V, Clarke V. Using thematic analysis in psychology. *Qual. Res. Psychol*. 3, 77–101 (2006).
25. Heather N, Raistrick D, Tober G, Godfrey C, Parrott S. Leeds Dependence Questionnaire: new data from a large sample of clinic attenders. *Addict. Res. Theory*. 9, 253–269 (2001).
26. Ferrari A, Cicero AFG, Bertolini A, Leone S, Pasciullo G, Sternieri E. Need for analgesics/drugs of abuse: a comparison between headache patients and addicts by the Leeds Dependence Questionnaire (LDQ). *Cephalalgia*. 26, 187–193 (2006).
27. Corbelli I, Caproni S, Eusebi P, Sarchielli P. Drug-dependence behaviour and outcome of medication-overuse headache after treatment. *J. Headache Pain*. 13, 653–660 (2012).
28. Sobel ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: *Sociological Methodology*. Leinhart S (Ed.), Jossey-Bass, San Francisco, CA, USA, 290-312 (1982).
29. Preacher KJ, Hayes A. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav. Res. Meth. Ins. C.* 36, 717–731 (2004).
30. Nasiri A, Kazemi-Zahrani H. The effectiveness of group acceptance and commitment therapy on pain intensity, pain catastrophizing and pain-associated anxiety in patients with chronic pain. *Asian Soc. Sci.* 11, 112 (2015).
31. Dhokia M, Elander J, Clements K, Gilbert P. A randomized-controlled pilot trial of an online compassionate mind training intervention to help people with chronic pain avoid analgesic misuse. *Psychol. Addict. Behav.* 34, 726-733 (2020).
32. Garland EL, Hudak J, Hanley AW, Nakamura Y. Mindfulness-oriented recovery enhancement reduces opioid dose in primary care by strengthening autonomic regulation during meditation. *Am. Psychol.* 75, 840 (2020).
33. Hilton L, Hempel S, Ewing BA, Apaydin E, Xenakis L, Newberry S, Colaiaco B, Maher AR, Shanman RM, Sorbero ME, Maglione, MA, Mindfulness meditation for chronic pain: systematic review and meta-analysis. *Ann. Behav. Med.* 51, 199–213 (2017).

34. Jinich-Diamant A, Garland E, Baumgartner J, Gonzalez N, Riegner G, Birenbaum J, Case L, Zeidan, F. Neurophysiological mechanisms supporting mindfulness meditation–based pain relief: an updated review. *Curr. Pain Headache Rep.* 24, 1–10 (2020).
35. Kabat-Zinn J, Lipworth L, Burney R. The clinical use of mindfulness meditation for the self-regulation of chronic pain. *J. Behav. Med.* 8, 163–190 (1985).
36. Polaski AM, Phelps AL, Kostek MC, Szucs KA, Kolber BJ. (2019). Exercise-induced hypoalgesia: A meta-analysis of exercise dosing for the treatment of chronic pain. *PloS ONE.* 14, e0210418 (2019).
37. Geneen LJ, Moore RA, Clarke C, Martin D, Colvin LA, Smith BH. Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews. *Cochrane Database of Syst. Rev.* 4, CD011279 (2017).

Appendix A. Table A1. Study variables and results of tests of associations with degree of pain medication dependence and presence of severe pain medication dependence

Variable	**Sample descriptive**	**Associations with degree of dependence[1]**				**Associations with presence of severe dependence[2]**			
Continuous measures	***Mean (SD)***	***Spearman's rho***			***p***	***Mean (SD)***		***U[3]***	***p***
						LDQ<20	*LDQ≥20*		
Age	56.57 (14.74)	0.162			0.097	56.36 (14.71)	57.80 (15.39)	634.0	0.66
Spinal pain duration (months)	85.55 (109.12)	0.212			0.031	83.52 (111.83)	98.57 (92.23)	525.0	0.32
Spinal pain intensity	7.41 (1.70)	0.529			<0.001	7.16 (1.64)	8.87 (1.30)	286.5	<0.001
LDQ score	11.52 (7.35)	-			-	-	-	-	-
Binary measures	***N (%)***	***Mean (SD) dependence[1] by group***				***Proportions with severe dependence[2]***		***X²***	***p***
		Female	*Male*	**t**	***p***	*Female*	*Male*		
Male	36 (34%)	11.13 (7.31)	12.28 (7.49)	0.76	0.449	9/70 (12.9%)	6/36 (16.7%)	0.28	0.59
		No	*Yes*			*No*	*Yes*		
Married/cohabiting	63 (59.4%)	11.51 (7.10)	11.52 (7.58)	0.01	0.993	6/43 (14.0%)	9/63 (14.3%)	0.00	0.96
Disabled by pain	67 (63.2%)	6.41 (5.20)	14.49 (6.79)	6.42	<0.001	1/39 (2.6%)	14/67 (20.9%)	6.82	0.009
Severely dependent[2]	15 (14.2%)	-	-	-		-	-	-	
Types of pain medication		*No*	*Yes*			*No*	*Yes*		
Prescribed pain medication	94 (88.7%)	7.08 (5.95)	12.09 (7.35)	2.26	0.026	1/12 (8.3%)	14/94 (14.9%)	0.03	0.86
OTC pain medication	66 (62.3%)	11.28 (7.51)	11.67 (7.31)	0.27	0.792	5/40 (12.5%)	10/66 (15.2%)	0.14	0.70
Strong opioid	27 (25.5%)	10.27 (6.60)	15.19 (8.31)	3.12	0.002	8/79 (10.1%)	7/27 (25.9%)	2.94	0.09
Weak opioid	42 (39.6%)	12.02 (7.70)	10.76 (6.81)	0.86	0.393	12/64 (18.8%)	3/42 (7.1%)	2.81	0.09
NSAIDs	44 (41.5%)	12.56 (7.58)	10.05 (6.83)	1.76	0.082	10/62 (16.1%)	5/44 (11.4%)	0.48	0.49
Anticonvulsant medication	41 (38.7%)	10.38 (6.81)	13.32 (7.90)	2.03	0.045	6/65 (9.2%)	9/41 (22.0%)	3.35	0.07
Antidepressant medication	12 (11.3%)	11.51 (7.35)	11.58 (7.72)	0.03	0.974	13/94 (13.8%)	2/12 (16.7%)	0.00	1.00
Antianxiety medication	3 (2.8%)	11.69 (7.35)	5.67 (5.51)	1.41	0.163	15/103 (14.6%)	0/3 (0.0%)	0.00	1.00
Acetaminophen/paracetamol	61 (57.5%)	10.60 (7.32)	12.20 (7.37)	1.11	0.271	5/45 (11.1%)	10/61 (16.4%)	0.60	0.44
Risk behaviours for medication misuse		*No*	*Yes*	***t***	***p***	*No*	*Yes*	***X²***	***p***
Felt addicted to pain medication	6 (5.7%)	11.04 (7.05)	19.50 (8.36)	2.83	0.006	12/100 (12.0%)	3/6 (50.0%)	3.96	0.046
Used pain medication for other problems	45 (42.5%)	10.13 (7.34)	13.40 (7.02)	2.31	0.023	7/61 (11.5%)	8/45 (17.8%)	0.85	0.36
Saved up unused pain medications	37 (34.9%)	10.87 (7.36)	12.73 (7.28)	1.25	0.216	9/69 (13.0%)	6/37 (16.2%)	0.20	0.66
Lost pain medications	6 (5.7%)	11.48 (7.26)	12.17 (9.50)	0.22	0.825	14/100 (14.0%)	1/6 (16.7%)	0.00	1.00

Been taken off pain medications	10 (9.4%)	11.72 (7.48)	9.60 (6.00)	0.87	0.388	14/96 (14.6%)	1/10 (10.0%)	0.00	1.00
Used another prescriber	18 (17.0%)	11.19 (7.31)	13.11 (7.55)	1.01	0.316	12/88 (13.6%)	3/18 (16.7%)	0.00	1.00
Taken differently from how prescribed	14 (13.2%)	11.02 (7.19)	14.79 (7.87)	1.80	0.074	11/92 (12.0%)	4/14 (28.6%)	1.56	0.21
Taken more medication than prescribed	31 (29.2%)	9.48 (7.08)	16.45 (5.48)	4.90	<0.001	7/75 (9.3%)	8/31 (25.8%)	3.64	0.06
Borrowed pain medication	6 (5.7%)	11.12 (7.22)	18.17 (6.80)	2.33	0.022	12/100 (12.0%)	3/6 (50.0%)	3.96	0.046
Worried about own use	13 (12.3%)	10.81 (7.11)	16.62 (7.30)	2.75	0.007	11/93 (11.8%)	4/13 (30.8%)	1.99	0.16
Others worried about use	7 (6.6%)	11.11 (7.23)	17.29 (7.18)	2.19	0.031	13/99 (13.1%)	2/7 (28.6%)	0.33	0.57
Emergency phone call or clinic visit	10 (9.4%)	10.81 (6.99)	18.30 (7.70)	3.20	0.002	11/96 (11.5%)	4/10 (40.0%)	3.95	0.047

Notes to Table A1:

1. Dimensional LDQ scores.
2. LDQ scores ≥20.
3. Mann-Witney's U statistic.

LDQ=Leeds dependence questionnaire; NSAID= non-steroidal anti-inflammatory drugs.

Appendix B. Semi-structured interviews

Interview participants

Interviews were conducted with six consenting participants including three with LDQ scores above or close to the 20-point cut-off and three with much lower scores (see Table B1).

Table B1. Interview participants

Pseudonym	Age	Gender	Occupational sector	Analgesics used	LDQ score
Angela	52	Female	Healthcare	Gabapentin, pregabalin, ibuprofen, paracetamol, paroxetine	20
Janet	54	Female	Healthcare	Naproxen, gabapentin, paracetamol, omeprazole, ibuprofen gel	21
John	72	Male	Engineering (retired)	Codeine, paracetamol	18
Brenda	72	Female	Retired	Naproxen, co-codamol	7
Glyn	46	Male	Engineering	Gabapentin, Paracetamol, ibuprofen, codeine, oxycodone, tramadol	9
Audrey	45	Female	Education	Morphine, codeine, naproxen	7

Note: Some personal details have been changed to protect participants' anonymity. LDQ=Leeds Dependence Questionnaire.

Analysis of interview data

The thematic analysis resulted in two key themes: 1) reasons for pain medication and 2) concerns about pain medication. These are presented briefly below. A fuller set of the relevant interview responses is given in Table B2 below.

The first theme concerned participants' reasons for using pain medication. These included wanting to be more active and mobile, to reduce anxiety or depression, or to follow medical advice, but the most central, common and important reason was pain:

> "*I just wanted to get rid of the pain, that's all I wanted*" (Angela)
> "*As soon as the pain comes then I'm taking naproxen, they've given me a stronger one, so I just take that. And if not, then codeine*" (Audrey)

The second theme captured participants' concerns about pain medication. This included concerns about opioids, reactions to overdoses, and preferences for alternative methods of pain control:

> "*They mentioned the opioid ones, and I really don't want to start taking them if I can help it, not yet anyway*" (Brenda)

> "*I took the whole packet of ibuprofen and paracetamol to be honest. And then since that day I haven't touched ibuprofen or paracetamol … that was when it really got to me, and I thought I can't take this anymore*" (Audrey)

> "*I was using gabapentin 1500mg a day and now I'm down to 5 since the acupuncture*" (Janet)

One participant described an addiction to pain medication, and that person had recognised the signs of addiction and taken action to change his use of pain medication:

> "*It would get to three and a half hours [after taking the last dose of pain medication] and I'd start sweating … when it got to the four hours, if I didn't take it on the four hours I'd really, really sweat. The pain would come back, I'd start shaking, it felt like my blood sugar had gone low if you know what I mean. And then I'd take one, and it made me feel alright, and that's sort of what made me realise 'hang on a minute, there's something going on here*" (Glyn)

> "*… the oxycodone was a brilliant drug for blocking the pain, but it was very addictive… Within about two months of me being on it I was addicted so, I mean I knew the symptoms of addiction so I went to the doctor and he weaned me off them and got me on something else. That's when I went on the gabapentin*" (Glyn)

Discussion of interview data

Three of the interviewees had LDQ scores above or close to the cut-off for severe dependence but the description of pain medication addiction was given by a person with an LDQ score indicating only mild dependence. This may be because most people taking prescribed pain medication tend not to perceive or describe their use of pain medication in terms of addiction, and because addictive patterns of medication use change over time as people monitor their use and make changes in response to patterns that cause concern. The full description of addiction given by 'Glyn' could potentially be translated into useful patient education material to promote greater recognition of symptoms of addiction to pain medication and greater recognition of the value of taking prompt action in response.

Table B2. Participants' descriptions of experiences of analgesic use (pseudonyms are used and some personal details have been changed to protect interview participants' anonymity)

1. Factors that influence use of pain medication
1.1 Pain
When asked about the factors that influenced their use of pain medication, participants all referred to their pain as the main or only factor: "I just wanted to get rid of the pain, that's all I wanted. All I wanted to be able to do was things normally that anybody else can do, without either dropping things or being in pain. And it's, because it does burn and get excruciating at times but it

constantly aches, I mean it makes you, it gets you down in the end doesn't it […] I just want someone to take the pain away." (Angela)

"As soon as the pain comes then I'm taking naproxen, they've given me a stronger one, so I just take that. And if not, then codeine." (Audrey)

This included participants' descriptions of their reasons for increases or decreases in their analgesic use:

"But that [taking pregabalin] started on just 75mg at night and it got to a stage where it didn't touch it [the pain]. And I just, I didn't know what to do with myself, so GP then said try increasing it morning and night, and said I could go up to three a day but I tried not to because I feel like having that one just in case things get any worse means I have something to rely on." (Angela)

1.2 Physical activity/mobility

"At the moment I've increased the paracetamol and naproxen whilst I was on holiday because I wanted to walk more." (Janet)

"Yeah. I carried on, and like I said that was probably the best painkiller I was on because I could carry on working." (Glyn)

1.3 Anxiety and distress

Several participants described taking medication for psychological symptoms other than pain:

"I take sertraline for anxiety and depression, I haven't had any symptoms really for the last year but I feel better taking it and I don't want to risk stopping." (Janet)

Several participants described ways that pain and psychological symptoms like depression and anxiety influenced one another:

"Yes, it makes me more worried about things that are in themselves slightly anxiety-related. You know what I mean? If I'm in pain it's harder to deal with the anxiety." (Janet)

1.4 Decision making about pain medication

Others described how they valued being able to have their pain and medication needs reassessed:

"I suppose as I said if the time came for me to go onto something a lot stronger and have the whole thing reassessed, but currently I don't feel as if I need to see anyone to get that checked and sorted." (Brenda)

"What the doctor agreed to do as I was coming off the oxy-codeine if they built up the gabapentin, if I was on a lower dose of gabapentin and reducing the dose of the oxy-codeine at the same time, then as the oxy-codeine went lower the gabapentin went up." (Glyn)

"The doctor/GP was very good, knew the situation, and obviously being self-employed I was still working, so he knew that I had to have some pain relief. I couldn't just go cold-turkey and then wait again. And seeing the scan of the disc, which was quite badly trapping the spinal cord at that time." (Glyn)

2. Concerns about pain medication
2.1 Avoiding opioids
Several participants described reasons for reducing or stopping pain medication: "I don't look for them, and I did stop taking the naproxen of my own choice for a while, because I thought I've been taking these for so long and I left them for maybe two months, three months, about two years ago […] they said if you felt alright that's your decision but they said we are looking at a stage where we might have to up the painkillers. And they mentioned the opioid ones, and I really don't want to start taking them if I can help it, not yet anyway. And I don't need them at the minute." (Brenda)
2.2 Health
"I did stop taking the naproxen of my own choice for a while, because I thought I've been taking these for so long and I left them for maybe two months, three months, about two years ago. So I dropped it down and then left them off completely. For a while I just thought maybe my stomach needed a breather from me taking them." (Brenda) "Well sometimes I get sick and tired of them, you know … because I'm on anti-depressants as well so sometimes it's just annoying, it makes me fed up and I just don't take anything at all. I just cope with the pain. And then obviously when I need it, I just take it." (Audrey)
2.3 Reactions to overdoses
The reasons participants gave for reducing or stopping pain medication included a reaction to taking an overdose of pain medication: "Well it's been about… three years, and that's when I suffered from a really bad back problem and I did take an overdose of it. Ibuprofen and paracetamol, that was when it really got to me, and I thought I can't take this anymore." (Audrey) "Yeah, I took the whole packet of ibuprofen and paracetamol to be honest. And then since that day I haven't touched ibuprofen or paracetamol. And I used to carry them around with me all the time, but now I don't. I have naproxen and codeine and all that in my handbag, and when I need it, I just take it but I don't have paracetamol or ibuprofen in my handbag anymore. My daughter's taken it out." (Audrey)
2.4 Fear of being without painkillers
Participants also described feelings of anxiety about having their pain medication reduced or withdrawn: "That was a big concern yes, that they could just easily reduce the painkillers and I could have gone, maybe a couple of weeks without painkillers. I don't think I'd have got through that." (Glyn) "I read up about them and found that if you stopped relatively quick you could have a heart attack. So, I was worried about that, worried about weaning it off fast and also worried about the pain, because at that stage when I was on oxy-codeine I couldn't bear not having any painkillers sort of every four hours." (Glyn)

"You just – it's hard to explain, because the pain was so intense at that stage, it was, the feeling in your head is that if you go to the doctors and they say they have to stop your painkillers, then what am I going to do, how am I going to live through the next day, live through the next night?" (Glyn)

2.5 Experience of addiction

Only one participant described being addicted to pain medication:

"I was addicted to oxycodone so they brought me off that and put me up on, I think it was gabapentin, 300mg, at the same time. Because I was getting really bad shakes and sweats, once they started tailing off, so I was sweating to the extreme, I was sick and shaking. Yeah, the oxycodone was a brilliant drug for blocking the pain, but it was very addictive… Within about two months of me being on it I was addicted so, I mean I knew the symptoms of addiction so I went to the doctor and he weaned me off them and got me on something else. That's when I went on the gabapentin." (Glyn)

"I was getting serious withdrawal symptoms within that time period. I mean, I was taking a heavy, heavy dose – the maximum dose – but you know the pain levels started to get to the point where I could feel the pain coming back on, but the sweats were just… the night sweats, in bed, the wife had to change the bed in the middle of the night it was that bad. But they were relatively good at blocking the pain." (Glyn)

"it would get to three and a half hours [after taking the last does of pain medication] and I'd start sweating and I'd start … I'd start sweating, and when it got to the four hours, if I didn't take it on the four hours I'd really, really sweat. The pain would come back, I'd start shaking, it felt like my blood sugar had gone low if you know what I mean. And then I'd take one, and it made me feel alright, and that's sort of what made me realise 'hang on a minute, there's something going on here'." (Glyn)

2.6 Alternatives to pain medication

Asked about how they saw the future for their spinal pain, or what they would like to change about their pain control, several participants referred to the possibility of a decisive intervention to reduce or remove their pain …

"I'm thinking perhaps they [the pain clinic] will do something that will take the pain away. I mean that's all we're waiting for, somebody to give me something to get rid of the pain so I can go back to work and do normal things and be normal." (Angela)

One participant described the impact that surgery had made to his pain:

"Oh yeah surgery's made a massive difference. I mean, I've still got back pain and I've lost some nerves in my legs and that but, you know, I can walk now – let's put it that way. I couldn't walk before." (Glyn)

Several participants described positive experiences with non-pharmacological pain control:

"I've got one more session of a six-session course of acupuncture, and that has helped a lot with pain though not with function. So, for example, before I was

using gabapentin 1500mg a day and now I'm down to 5 since the acupuncture." (Janet)

"I need to use the sort of CBT-type reframing 'I have this but I'm going to react in this way, this takes me to this place' rather than 'I'm going to wallow in self-pity' or 'I'm going to allow myself to catastrophise' or, you know whatever. So, say those techniques help and I use those more than I use the painkillers." (Janet)