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Natural course of acute neck and low back pain in the general population: The HUNT study

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ABSTRACT

In this prospective cohort study we aimed to describe the natural course of acute neck and low back pain in a general population of Norway. We screened 9056 subjects aged 20–67 years who participated in a general health survey for a new episode of neck or low back pain the previous month. The screening identified 219 subjects who formed the cohort for this study. Pain intensity was reported on a numeric rating scale (0–10) at 1, 2, 3, 6, and 12 months after start of the new pain episode. The course of pain was described for neck and low back pain, different baseline pain levels, age groups, and number of pain sites at baseline. Use of medication and health care was described and associations between pain intensity and seeking health care were estimated. Pain declined rapidly within 1 month after a new pain episode, with a reduction of 0.91 (95% confidence interval [CI] 0.50–1.32) for neck pain and 1.40 (95% CI 0.82–1.99) for low back pain with little change thereafter. However, pain remained unchanged over the follow-up year for those with equal pain in the neck and low back areas at baseline and for those reporting 4 or more pain sites at baseline. Only 1 in 5 sought health care for their complaints. Still, the course of pain was comparable to effect sizes reported in interventional studies. This study thus contributes natural course reference data for comparisons of pain outcome in clinical trials and practice.

1. Introduction

Natural course of musculoskeletal disorders constitutes the baseline against which all treatment effects need to be assessed in the clinic as well as clinical trials. Neck pain (NP) and low back pain (LBP) are the most prevalent musculoskeletal disorders in the general population [18,37,40]. Worldwide, the Global Burden of Disease Study 2010 now ranks LBP first and NP fourth in years lived with disability [46].

The course of LBP [16,19,43] and NP [36,45] has mainly been studied in primary care settings, with consistent evidence that symptoms rapidly decrease over the first few weeks and months [7,16,43], with little improvement beyond 3 months [14,15,45]. Complete resolution of symptoms is not attainable for all, even after 1 year [19]. While studies in primary care settings are appropriate for investigating clinical course and prognosis in patients, they are not optimal for studying natural course due to influence of health care providers and clinical interventions [44]. Little is known about the natural course in cases with a new pain episode in the general population, particularly for the short-term course within the period most people seek health care for their complaints. A Canadian general population study of subjects with prevalent symptoms found that only about 1/3 experienced complete resolutions of their NP [9] and LBP [5] during the 1-year follow-up. A Swiss study [41] of subjects with chronic and recurrent LBP identified different clusters with regard to pain and disability. Small changes in symptoms and cluster adherence were observed over the follow-up year. However, no general population studies have monitored the early course of NP and LBP in cases with a new pain episode.

We aimed to describe the natural course of NP and LBP over 1 year in cases of the general population with a new episode of NP or LBP. Additional aims were to describe the course of pain for different baseline pain levels, number of pain sites at baseline and age groups, and to describe medication and treatment utilization and associations between pain and health care seeking.

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2. Methods

2.1. Study design and population

We obtained data for the current prospective cohort study from 2 of the 24 municipalities that participated in the third wave of the Norwegian Nord-Trøndelag Health Study 2006–2008 (HUNT 3) [28]. All inhabitants of Nord-Trøndelag County aged 20 years or older were invited to HUNT 3, and 50,807 (54.1%) participated.

We screened 9056 subjects aged 20–67 years for eligibility to the current study. Three questions were used to identify the study cohort: 1) "Do you have pain in your shoulder-neck area or low back today?"; 2) "Is it less than one month since the pain started?"; and 3) "Were you without this pain the three months previous to last month?" Subjects answering "yes" to all 3 questions were invited to participate in the current study. Signed informed consent was obtained and the study was approved by the regional ethics committee.

2.2. Data collection

Data for the study were collected by questionnaires at 1, 2, 3, 6, and 12 months after pain debut. The baseline measurement at 1 month represents the point in time when the subjects attended HUNT 3 and when the new pain episode had lasted 1 month or less. The baseline questionnaire was presented to the subjects at the health survey location site and follow-up questionnaires sent by post at 2, 3, 6, and 12 months.

2.3. Variables

Main outcomes were current pain intensity and strongest pain intensity in the last 4 weeks. Subjects were grouped by pain location depending on the response to the question: "Where do you have most pain right now?" presented along with a graphical body figure demarcating the neck and low back areas. The subjects were asked to mark both areas only when the pain was equally intense in both areas. Subjects were subsequently classified into 1 of the 3 pain location groups: NP, LBP, or NP and LBP. "Shoulder and neck" defines the same area more commonly termed "neck" [10] and the latter term is used throughout the current paper. Pain intensity was recorded on a 0–10 numeric rating scale (NRS) with checkbox 0 labelled "no pain" and 10 labelled "worst imaginable pain." Subjects were asked to rate the pain intensity for the area or areas they marked as most painful.

From the baseline questionnaire we obtained age, sex, work status (partial or full sick leave, working as normal), time since first pain episode (never, <1 year, 1–5 years, more than 5 years), frequency of pain episodes (never, once a year or less, 2 or more per year), and total number of musculoskeletal pain sites (maximum 12 sites). At baseline and at each follow-up, the subjects reported use of pain medication (previous week), treatment (previous month), and sick leave status (at present). Subjects could checkmark different over-the-counter and prescription pain medications and different treatment alternatives by professions (physician, physical therapist, psychologist, chiropractor, acupuncture, homeopath, and other complementary care). Sick leave was defined as full time or partial sick leave or being on rehabilitation reimbursement aimed at return to work.

2.4. Statistical analysis

We analysed pain over time using multilevel mixed-effects linear regression models with random slopes (time). To assess how the course of pain developed for different groups, product terms between each registration time-point and the pain location (NP, LBP, or NP and LBP), categories of current pain at baseline (NRS: 0–2, 3, 4–5, and 6–8), age groups (20–39, 40–54, and 55–70 years), and total number of musculoskeletal pain sites at baseline (1, 2, 3, and $\geqslant 4$) were included in different models. We adjusted for age, sex, baseline work status, time since first pain episode, and frequency of pain episodes prior to baseline. The results were presented as predicted levels of pain, holding control variables constant at mean values. As smoking and psychological disorders may influence the course of pain intensity, we also performed analyses with smoking (current smoking/no current smoking), anxiety, and depression as covariates. Hospital Anxiety and Depression Scale was dichotomized at 8 and above [3]. We did not attempt to replace missing values. Individual variability in pain intensity over time was analysed with descriptive statistics.

We pooled treatment data to describe the proportion seeking traditional (physician, psychologist, physical therapist, or chiropractor) and complementary treatment (homeopath, acupuncturist, osteopath, naprapath, or other complementary therapists) by different levels of current and strongest pain. The precision of the estimates was assessed with 95% confidence intervals (CIs). STATA 12 for windows was used for analysis (Stata Corp., College Station, TX, USA).

3. Results

Prevalence of current NP or LBP was 34% in the 9056 subjects screened for eligibility, but only 3% had experienced the pain for <1 month (Fig. 1). We excluded 79 subjects who declined to participate and 13 subjects who reported "no pain" on the baseline questionnaire, and this left 219 subjects for analyses. The follow-up rate ranged from 90% at 2 months to 80% at 12 months. Baseline characteristics are shown in Table 1. Sample mean age was 46 years and 60% were women. Subjects with NP and LBP were slightly older than those with either NP or LBP. Only 16% reported no previous pain episodes. Two or more pain episodes per year were reported by 58% in NP, 61% in LBP, and 79% in the NP and LBP groups, respectively.

3.1. Course of pain by pain location

Adjusted overall mean current pain at baseline was 3.64 (95% CI 3.4–3.9), with no difference between the location groups ($P = 0.95$). Current pain was reduced by 0.91 (95% CI 0.50–1.32) and 1.40 (95% CI 0.82–1.99) at 1 month after the new NP or LBP episode, respectively, with little change thereafter (Table 2, Fig. 2A). Adjusted mean pain did not drop below 2 on the NRS for either group at any time during the follow-up period. Average pain reduction at 3, 6, and 12 months was 30%, 35%, and 40%, respectively, for NP, and 30%, 46%, and 42%, respectively, for LBP. Contrarily, pain was almost unchanged over the follow-up for subjects reporting equal pain at both sites. Current pain at 12-month follow-up was 2.2 (95% CI 1.7–2.6) among subjects with NP, 2.1 (95% CI 1.5–2.6) among subjects with LBP, and 3.4 (95% CI 2.4–4.4) among subjects with both NP and LBP. There was, however, large individual variability in pain intensity both at baseline and follow-up (see Supplementary Table 1 for descriptive data). Complete resolution of pain at 12-month follow-up, defined as 0 on the NRS, was reported by 43% in the NP, 36% in the LBP, and 20% in the NP and LBP groups. Course patterns for strongest pain during the last 4 weeks closely resembled that of current pain (Fig. 2B). Controlling for smoking, anxiety, and depression in the models did not change the course of symptoms for either current or strongest pain.

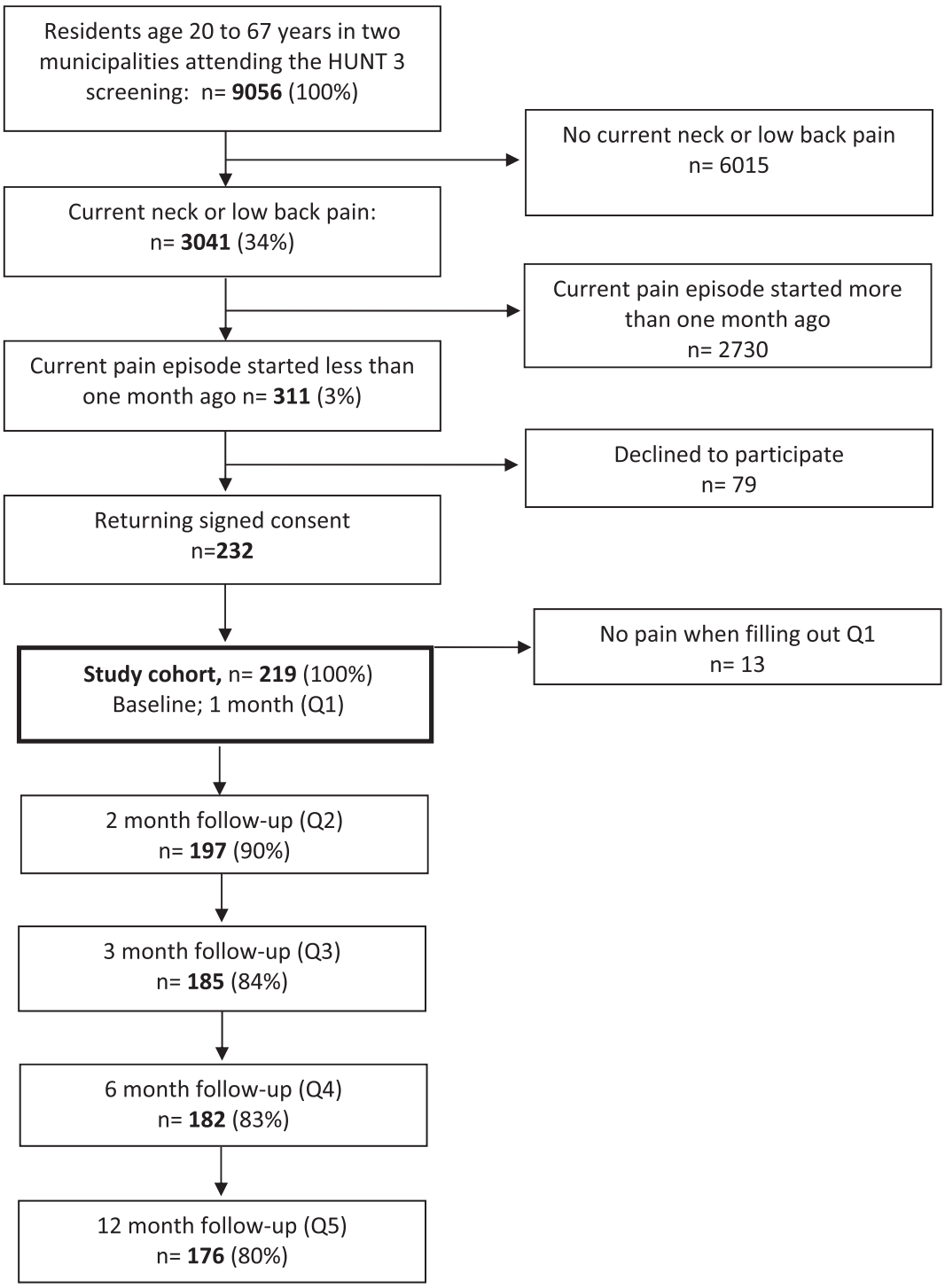

Fig. 1. Flowchart showing screening and follow-up of subjects with a new neck or low back pain episode. HUNT 3, the third wave of the Norwegian Nord-Trøndelag Health Study 2006–2008.

3.2. Course of current pain by age, pain intensity, and number of pain sites at baseline

The course of pain was found to decline rapidly in all age groups; a smaller reduction was seen for the oldest age group (55–67 years) and remained about one point above the youngest age group (20–39 years) during follow-up. At 12 months, mean pain was 2.7 (95% CI 2.0–3.3) for the oldest and 1.8 (95% CI 1.1–2.4) for the youngest age group. The course of pain according to baseline pain is shown in Figure 2C. Almost no change in pain was seen for subjects with low baseline pain (NRS $\leqslant$3). Pain declined steadily and levelled at 3 months for subjects with moderate baseline pain (NRS 4–5) and at 6 months for subjects with more severe baseline pain (NRS 6–8). In the latter 2 groups there was a tendency for pain to increase again between 6 and 12 months. For subjects reporting 4 or more musculoskeletal pain sites at baseline, there was little change in pain by 12 months (Fig. 2D). Pain decreased rapidly for subjects with one pain site, while pain declined more slowly for subjects with 2 or 3 pain sites.

Table 1
Baseline characteristics. Mean (SD) unless otherwise denoted.

Variable	n (%) or Mean (SD)			
	All n = 219	NP n = 116	LBP n = 77	NP and LBP n = 26
Gender (females, %)	131 (59.8)	75 (64.7)	39 (50.7)	17 (65.4)
Age (years)	45.8 (11.5)	44.1 (12.3)	46.6 (10.6)	51.1 (9.1)
Work status; employed	191 (87.2)	98 (84.5)	70 (90.9)	23 (88.5)
Sick leave or work rehabilitation[a]	12 (6.3)	5 (5.1)	6 (8.6)	1 (4.4)
Current pain (0–10)	3.6 (1.7)	3.6 (1.7)	3.6 (1.7)	3.7 (1.4)
Strongest pain last 4 wks (0–10)	5.6 (2.1)	5.4 (2.2)	5.7 (2.1)	5.8 (1.8)
Time since first pain episode (n, %)				
Never before	34 (16.0)	18 (16.1)	14 (18.7)	2 (8.0)
Less than a year ago	35 (16.5)	22 (19.6)	11 (14.7)	2 (8.0)
1–5 years ago	60 (28.3)	39 (34.8)	18 (24.0)	3 (12.0)
More than 5 years ago	83 (39.2)	33 (29.5)	32 (42.7)	18 (72.0)
Frequency of pain episodes (n, %)				
Never before	34 (16.2)	16 (14.3)	15 (20.3)	3 (12.5)
Once a year or less	47 (22.4)	31 (27.7)	14 (18.9)	2 (8.3)
Two or more per year	129 (61.4)	65 (58.0)	45 (60.8)	19 (79.2)

NP, neck pain; LBP, low back pain.
[a] Of those employed at baseline.

Table 2
Crude and adjusted current pain at baseline and follow-up, adjusted for age, sex, baseline work status, time since first pain episode, and frequency of pain episodes prior to baseline.

Variable	Mean current pain (95% CI)				
	1 mo (baseline)	2 mo	3 mo	6 mo	12 mo
NP (n = 116)					
Crude	3.6 (3.3–4.0)	2.6 (2.3–3.0)	2.5 (2.1–2.9)	2.3 (1.9–2.7)	2.1 (1.7–2.6)
Adjusted	3.6 (3.3–4.0)	2.7 (2.3–3.1)	2.5 (2.1–3.0)	2.4 (1.9–2.8)	2.2 (1.7–2.6)
LBP (n = 77)					
Crude	3.6 (3.2–4.0)	2.3 (1.8–2.7)	2.5 (2.1–2.9)	1.9 (1.4–2.4)	2.1 (1.5–2.6)
Adjusted	3.7 (3.3–4.1)	2.2 (1.8–2.7)	2.5 (2.0–3.0)	2.0 (1.4–2.5)	2.1 (1.5–2.6)
NP and LBP (n = 26)					
Crude	3.7 (3.0–4.4)	3.9 (3.1–4.7)	3.6 (2.7–4.5)	4.2 (3.3–5.1)	3.6 (2.6–4.6)
Adjusted	3.6 (2.9–4.4)	3.7 (2.8–4.5)	3.3 (2.4–4.2)	3.9 (3.0–4.9)	3.4 (2.4–4.4)

CI, confidence interval; NP, neck pain; LBP, low back pain.

3.3. Pain medication, health care treatment, and sick leave

Overall, 1 in 5 sought treatment at some point during follow-up (Table 3). Pain was weakly associated with seeking treatment at lower pain levels, but this increased markedly above pain level 5 for current pain and 7 for strongest pain in last 4 weeks (Fig. 3A, B). Use of pain medication and health care treatment (Table 3) during follow-up was higher in subjects with both NP and LBP (53% and 38%, respectively) compared to those with either NP or LBP (35% and 16%, respectively). For pain medication, 84% was over-the-counter medication and the rest by prescription. Among the 191 working subjects, only 12 (6.3%) reported sick leave at baseline, and <10% reported sick leave at any point in time during follow-up, except for those with both NP and LBP at 12 months, where 31% reported sick leave.

4. Discussion

In this cohort from a general population in Norway, we observed a rapid decline in pain within the first month of a new NP or LBP episode. Pain remained unchanged over the follow-up year for subjects with pain of equal intensity in the neck and low back areas at baseline, and for subjects with 4 or more musculoskeletal pain sites. Few sought health care treatment at lower pain levels (NRS <6), and only 1 in 5 sought health care treatment during follow-up.

4.1. Study limitations and strengths

More than 9000 individuals from the general population were screened to identify the current study cohort of 219 subjects. The strengths of this study include recruitment of subjects close to the inception of a new pain episode, with monthly recordings of the pain the first 3 months and follow-up over 1 year, high follow-up rates, and little influence of health care treatment. Interpretations of the results are limited by the low to moderate pain in these subjects. It is plausible that people with more severe complaints do not participate in general population studies. Pain was self-reported on mailed questionnaires without further confirmation. While the cause of NP and LBP rarely can be verified, it is possible that a few subjects in this study had specific pathology that went undetected. The course of symptoms may be different in subjects with severe comorbidities. Although we controlled for anxiety and depression, we did not have enough power to perform stratified analyses on those with severe symptoms of anxiety or depression. Another concern is whether the pain was confined to the locations of interest or part of a more widespread pain pattern. However, few were affected by widespread pain, as only 7% of the cohort reported pain in more than 2 pain sites outside the primary pain location (data not shown). Only those who checkmarked that the pain in the neck and low back was equally intense were classified with pain in both areas. Thirteen percent of NP individuals also reported some pain in the low back, and the same pro-

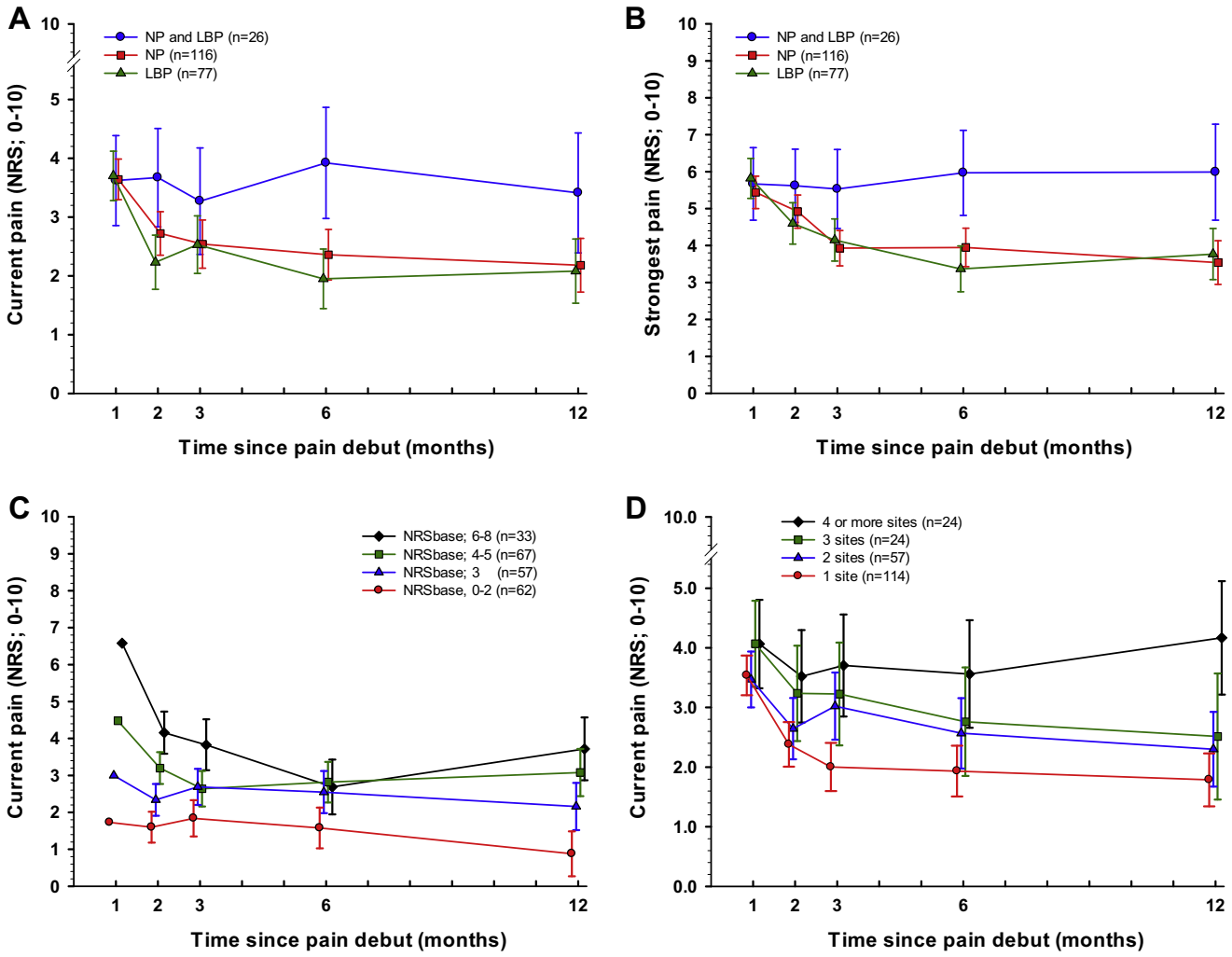

Fig. 2. One-year course of pain by pain location site (A and B), baseline pain levels (C), and total number of pain sites at baseline (D). Strongest pain lasts 4 weeks used as dependent variable in B and current pain in A, C, and D. Numbers in legends are number of subjects in each category at baseline. Analyses are adjusted for age, sex, baseline work status, time since first pain episode, and frequency of pain episodes prior to current episode. NRS, numeric rating scale; NP, neck pain; LBP, low back pain NP and LBP, neck and low back pain of equal pain intensity at baseline.

portion in the LBP group reported some NP, indicating that the proportion of individuals with pain in both areas was somewhat underestimated in our study.

4.2. Relevance of pain intensity

Pain intensity is associated with health care seeking [8,47], return to work [38,39], and clinical outcome and prognosis for NP [4,13] and LBP [6,11,21]. A review of prognostic factors for musculoskeletal pain in primary care identified higher pain at baseline, longer pain duration, multiple-site pain, and previous pain episodes among the most important factors for both NP and LBP [30]. High pain level and widespread pain were among the most significant predictors for long-term disability for both acute and chronic LBP patients [17], and widespread musculoskeletal pain was the strongest predictor for receiving disability pension in a large general population study [34]. It is thus possible that proper interventions for those who report localized pain of high intensity may reduce the likelihood of developing widespread pain and early disability pensioning. The current study also indicated that people with equal intensity in NP and LBP and people reporting pain in 4 or more pain sites represent subgroups that may require health care consideration, as pain in these subjects remained unchanged over the follow-up year. We acknowledge that other measures such as function and disability are also essential for long-term outcome [11,17], although pain and disability appear to follow similar patterns [12]. A recent meta-analysis demonstrated that pain improved rapidly but disability improved more slowly in acute and persistent LBP cases [11]. This might have implications for design and selection of outcome measures in future intervention studies.

4.3. Comparison to clinical studies

Pain at baseline was similar for the 3 pain location groups and fits into the lower range of clinical trials [2]. Those with NP or LBP showed a 30% reduction in pain 2 months after baseline, equal to an effect size of 0.6. This effect is similar to a range of clinical trials for NP [24] and LBP [2], although only 1 in 5 received treatment during the 1-year follow-up in the current study. A recent review of manual therapy and exercise for NP showed a pooled effect size of 0.5 for short-term pain relief [33]. Patients with LBP enrolled in an 8-week study of exercise interventions experienced an overall pain reduction of 33% [42], compared to 32% in this study at 3-month follow-up, and where pain at baseline was in the same range in the 2 studies (ie, current pain 3.4 vs 3.7 in this study). A meta-analysis of a large number of primary care LBP trials showed

Table 3
Number of subjects (%) taking pain medication, receiving treatment, or on sick leave at baseline and during follow-up.

	1 mo n (%)	2 mo n (%)	3 mo n (%)	6 mo n (%)	12 mo n (%)
n					
NP	116	106	95	94	92
LBP	77	67	68	67	64
NP and LBP	26	24	21	21	20
Total	219 (100)	197 (90)	184 (84)	182 (83)	176 (80)
Pain medication					
NP	52 (45)	47 (44)	32 (34)	34 (36)	31 (34)
LBP	35 (45)	18 (27)	17 (25)	17 (25)	15 (23)
NP and LBP	15 (58)	14 (58)	11 (52)	9 (43)	10 (50)
Total	102 (46.6)	79 (40.1)	60 (32.6)	60 (33.0)	56 (31.8)
Treatment					
NP	13 (11)	19 (18)	18 (19)	17 (18)	20 (22)
LBP	12 (16)	14 (21)	8 (12)	6 (9)	11 (17)
NP and LBP	11 (42)	11 (46)	8 (38)	5 (24)	8 (40)
Total	36 (16.4)	44 (22.3)	34 (18.5)	28 (15.4)	39 (22.2)
Sick leave[a]					
NP	5/98 (5)	6/94 (6)	4/85 (5)	6/81 (7)	4/74 (5)
LBP	6/70 (9)	2/59 (3)	2/60 (3)	2/57 (4)	3/55 (5)
NP and LBP	1/23 (4)	0/20 (0)	1/18 (6)	0/18 (0)	5/16 (31)
Total	12/191 (6.3)	8/173 (4.6)	7/163 (4.3)	8/156 (5.1)	12/145 (8.3)

NP, neck pain; LBP, low back pain; Pain medication, total over-the-counter and prescription pain medication; Treatment, summed physical therapist, psychologist, chiropractor, homeopath, and alternative medicine treatment; Sick leave, sickness certificate or enrollment in work rehabilitation program.
[a] Number of subjects (%) on sick leave relative to those reporting full- or part-time work at baseline (missing excluded).

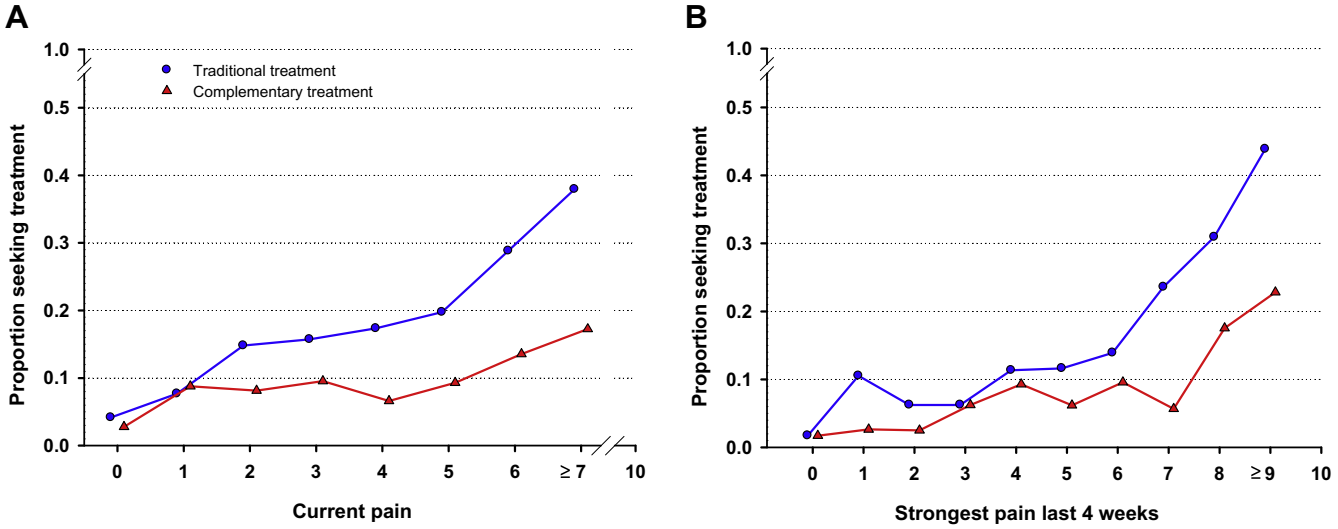

Fig. 3. Proportion of subjects seeking traditional (physician, psychologist, physical therapist, or chiropractor) and complementary (homeopath, acupuncturist, osteopath, naprapath, or other complementary therapists) health care treatment in the previous month by different levels of current (A) and strongest (B) pain.

an effect size for pain improvement measured as standardized mean difference (mean $diff_{t0-t6wks}/SD_{baseline}$) of 0.86 at 6 weeks [2]. This is not markedly different from the LBP subjects in this study with standardized mean difference of 0.80 at 1 month- and 0.64 at 2-month follow-up (data not shown).

Hill et al. found that patients with LBP who were determined to be at low risk for chronicity showed a similar course of pain as the NP and LBP groups in this study [22]. Before intervention, the management of patients with LBP in primary care was stratified according to prognosis (low, medium, high). The low-risk group received minimal intervention (ie, examination and advice by the general practitioner). The outcome in pain and function in the low-risk intervention group was noninferior to the control group receiving current best practice, in spite of far fewer referrals for treatment (7%) compared to the control group (49%) [22]. This questions the role of extensive health care interventions for patients with low to moderate pain, which is supported by our study. Pain improvement in our subjects who largely refrain from health care services was not critically different from that of patients in clinical studies receiving a variety of different interventions [2,24]. Brief intervention programs have been demonstrated to be equally or more effective than extensive interventions in increasing return to work in LBP [25]. Furthermore, in some patients, daily activities of living may produce modest increases in pain that may simply resolve over time without health care management.

4.4. Future directions

This cohort of people from the general population with a new episode of NP or LBP was not favoured by a fortunate pain history. Previous pain episodes were reported by 84% and the majority experienced their first episode more than a year ago. Few received

health care treatment, and 19 of 20 holding a paid job kept working throughout the follow-up year. Yet, their pain improvement resembles patients in clinical trials [23,42]. The fact that symptom history and course of pain were comparable in these subjects to patients in clinical trials may call for reappraisal of health care management in individuals with low to moderate pain levels [6,22,38]. Current evidence does not convincingly favour clinical interventions that at best show small to modest effects [2,27,29,35]. Musculoskeletal pain and the risk for chronicity seem to be established early in life [20,31]. The observation that small changes occur once symptoms are established supports research into risk factors in younger age groups closer to the first incidence [1,26]. Unfortunately, knowledge of prognostic factors in patients [11] or individual risk factors in asymptomatic individuals [32] is far from complete, and there are few studies of adolescents [31]. If the likelihood of developing symptoms is present early in life, then early prevention and proper handling of these individuals once they present to a health care provider the first time become critical. This is an area that deserves further research.

4.5. Conclusion

This study contributes descriptions of the natural course of pain during the first year after a new episode of NP and LBP in people from the general population who largely refrained from health care treatment. NP and LBP declined rapidly by 1 month for most, with small changes over the follow-up year. The course appears comparable to effect sizes reported in interventional studies. However, pain remained unchanged for those with NP and LBP of equal intensity and for those reporting 4 or more pain sites at baseline. Pain was weakly associated with care seeking. Research and clinical management should be guided by information on the natural course of symptoms to assure that treatment is worthwhile to the patients.

Conflict of interest statement

The authors have no conflicts of interest.

Acknowledgements

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.pain.2013.03.032.

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