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Complete List of Authors:	Vigdal, Ørjan; Oslo Metropolitan University, Department of Physiotherapy Storheim, Kjersti; Oslo University Hospital; Oslo Metropolitan University, Department of Physiotherapy Munk Killingmo, Rikke ; Oslo Metropolitan University Faculty of Health Sciences, Department of Physiotherapy Småstuen, Milada; Oslo Metropolitan University, Department of Nursing and Health Promotion Grotle, Margreth; Oslo Metropolitan University, Department of Physiotherapy; Oslo universitetssykehus Ulleval, Research and Communication Unit for Musculoskeletal Health
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Article title:

Characteristics of older adults with back pain associated with choice of first primary care provider: The Back Complaints in the Elders – Norway (BACE-N) study

Authors:
Ørjan Nesse Vigdal[1]

Kjersti Storheim[2,1]

Rikke Munk Killingmo[1]

Milada C. Småstuen[1]

Margreth Grotle[1,2]

Author affiliations:

[1]Department of Physiotherapy, Faculty of Health Science, OsloMet - Oslo Metropolitan University, Oslo, Norway

[2]Research and Communication Unit for Musculoskeletal Health (FORMI), Division of Clinical Neuroscience, Oslo University Hospital, Oslo, Norway

Corresponding author:
Ørjan Nesse Vigdal

E-mail address: orvig@oslomet.no
Mailing address: OsloMet – Oslo Metropolitan University, Post box 4, St.Olavs plass, 0130 Oslo, Norway
Telephone number: +47 414 59 314

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Abstract

Background: Studies of older adults with back pain in primary care have found significant national differences in patient characteristics. There is a lack of knowledge of whether characteristics of older back pain patients differ according to their choice of first primary care provider.

Objectives: To describe characteristics of older adults with back pain in primary care, and to assess associations between patient characteristics and type of first primary care provider (general practitioner (GP), physiotherapist (PT) or chiropractor).

Methods: This cross-sectional study included patients aged ≥55 years seeking Norwegian primary care with a new episode of back pain. Patient characteristics were collected through questionnaires and a clinical examination, covering the following domains: sociodemographic, general health, current and previous back pain, psychological and clinical factors. Associations between patient characteristics and visiting a GP or PT compared to a chiropractor were assessed with multiple multinomial regression analyses.

Results: We included 452 patients: 127 first visited a GP, 130 first visited a PT and 195 first visited a chiropractor. Median (IQR) age was 66 (59-72) years. Median (IQR) back-related disability (Roland-Morris Disability Questionnaire, 0-24) was 9 (5-13). Recurring episodes were common, 301 (67%) patients had monthly or yearly recurrences. Patients with worse back-related disability, longer duration of symptoms, lower expectations for full recovery and worse physical performance measured with the Back Performance scale had higher odds of visiting a GP or PT compared to a chiropractor.

Conclusion: Older back pain patients in primary care had moderate to severe levels of back-related disability, and most had recurring episodes. Our results suggest that older adult's choice of first primary care provider was associated with important patient characteristics, which highlights the need for caution with generalizations of study results across primary care populations.

Trial registration number: ClinicalTrials identifier: NCT04261309

Data availability statement

Data not available.

Keywords: Back pain, older adults, primary care, characteristics, care-seeking behaviour

Article summary

Strengths and limitations of this study

- This is the first study to compare characteristics of older adults with back pain visiting a GP, physiotherapist or chiropractor.
- This study provides a thorough comprehensive overview of older adults with back pain, and thus contributes with important knowledge in a research field with few previous studies
- It was not possible to obtain data on eligible patients that were not invited or declined to participate in the study. This might reduce external validity.

Introduction

Back pain is the number one cause of years lived with disability globally, with an estimated point prevalence of 11.9% [1, 2]. Older adults have historically been under-represented in back pain research [3, 4], but have recently received increased attention [5, 6]. Although the prevalence of pathoanatomical findings on diagnostic imaging increases with age [7-9], the prevalence of serious pathology, such as vertebral fractures and neuropathic pain, in older back pain patients in primary care is low. Studies have reported a prevalence of 6% and 2-11%, respectively [10, 11]. Moreover, studies in primary care have found significant national differences in the characteristics and burden of back pain in older adults [12, 13]. This highlights the importance of caution when generalizing results from studies from one setting to another.

Most patients seeking healthcare for back pain are treated in primary care [14]. In Norway, back pain is the reason for 10%, 27% and 86% of the visits to general practitioners (GP), physiotherapists (PT) and chiropractors, respectively [15]. One study suggests that choice of first primary care provider has consequences for future healthcare consumption [16]. To optimize decision making regarding treatment, research and health policies, detailed knowledge of patient populations is required. Most of the previous studies exploring patient populations seeking primary care have compared GP and chiropractic populations, showing that patients seeking care from a GP have a higher overall burden of back pain compared to chiropractic patients [17-24]. Only a few studies include PT populations [25-28]. These studies suggest that patients seeking care from PTs are older and have more disability than those seeking care from chiropractors [25, 26, 28]. To the best of our knowledge, only one study has been performed in an exclusively older population [27]. This study found that older women seeking care from GPs reported worse back pain and worse health-related quality of life than older women visiting a PT or a chiropractor [27]. The study only included women between 59-64 years of age, and it is not clear if the results are also generalizable to men or adults over 65 years of age. Further, they did not examine back-related disability or other back pain factors, sociodemographic factors, psychological factors or clinical factors. Thus, there is still a considerable lack of knowledge regarding whether characteristics of older back pain patients differ according to their choice of first primary care provider.

Therefore, the aims of this study were 1) to describe the characteristics of patients ≥55 years of age seeking primary care for a new episode of back pain in terms of sociodemographic, general health, current back pain and back pain history, psychological and clinical characteristics, and 2) to assess if patient characteristics are associated with type of first primary care provider (GP, PT or chiropractor).

Methods

Design and setting

This cross-sectional study presents baseline data from the Back Complaints in the Elders – Norway (BACE-N) study, a prospective observational cohort study in Norwegian primary care. The BACE-N study is a part of the international BACE consortium, with research groups from Brazil, the Netherlands and Australia [6]. The BACE-N study protocol has been registered in ClinicalTrials.gov (Identifier NCT04261309). The study was classified as a quality assessment study by the Norwegian Regional Committee for Medical Research Ethics (reference no. 2014/1634/REK vest) and was approved by the Norwegian Social Science Data Service in 2015 (reference no. 42149).

Participants and recruitment procedure

Eligible patients were ≥55 years of age, seeking primary care from a GP, PT or chiropractor in primary care for a new episode of back pain. Back pain was defined as pain located in the region from the top of the scapula to the sacrum, with or without radiating leg pain. A new episode was defined as not having received healthcare for the same complaint in the last six months. Patients were excluded if they had difficulties completing the questionnaire due to language barriers, or if they had difficulties completing the clinical examination (for example wheelchair-bound patients). Participants received care as usual.

Patients were recruited from GPs, PTs, and chiropractors in urban and rural parts of Norway between April 2015 and February 2020, either during or immediately after the consultation. The primary care providers were instructed to invite consecutive patients. To facilitate the recruitment process, media advertisements were also used. Eligible patients received oral and written information about the study. The final screening for eligibility and inclusion to the study was performed by the researchers. All included patients signed an informed consent form before enrolment in the study. The baseline measurements, consisting of questionnaires and a clinical examination, were collected as soon after the first primary care consultation as possible.

Measurements

Sociodemographic variables

Information regarding age, sex, marital status, employment status and educational level were collected.

General health variables

Health-related quality of life (HR-QoL) was measured using the Short-Form Health Survey 36-item (SF-36) physical and mental summary measures (range 0-100, higher score indicates better HR-QoL) [29]. Alcohol consumption was measured using the 3-item Alcohol Use Disorder Identification Test consumption questions (AUDIT-C) (range 0-12, higher score indicates higher alcohol consumption) [30]. Hazardous alcohol consumption was defined as an AUDIT-C score of ≥3/12 for women and ≥4/12 for men [31, 32]. Smoking status (current smoker, previous smoker, non-smoker) was collected. The number of comorbidities was measured using the Self-Administered Comorbidity Questionnaire (SCQ) [33]. The SCQ has 13 pre-defined comorbidities and two optional comorbidities. Item 12, "back pain", was replaced with a third optional comorbidity. Widespread pain was measured using the pain drawing from McGill Pain Questionnaire and the revised criteria from Wolfe et al. for widespread pain [34, 35]. The number of falls during the last six weeks was collected, and falls self-efficacy was measured using the Falls Efficacy Scale-International (FES-I) (range 16-64, higher score indicated lower falls efficacy) [36].

Current back pain and back pain history

Back pain location (thoracic or lumbar, or both) was collected. Average back pain severity last week was measured using the Numeric Rating Scale (NRS) (range 0-10, higher score indicates higher back pain severity) [37]. Back-related disability was measured with the 24-item Roland-Morris Disability Questionnaire (RMDQ) (range 0-24, higher score indicated more back-related disability) [38]. Back pain duration was measured in days and categorized into "<6 weeks", "6 weeks to 3 months", and ">3 months". Frequency of previous back pain episodes (monthly, yearly, every 1-5 years, every five years, once) was collected. Sleep problems attributable to back pain were measured using item 5i from the Pittsburgh Sleep Quality Index (PSQI) [39], and dichotomized to "weekly/less than weekly". Morning stiffness was measured with item six from Knee injury and Osteoarthritis Outcome Score (KOOS) [40], where we replaced the word "knee" with "back".

Psychological variables

Kinesiophobia was measured using the Fear-Avoidance Beliefs Questionnaire-Physical Activity subscale (FABQ-PA) (range 0-24, higher score indicates higher levels of kinesiophobia) [41]. Signs of depression were measured with the Center for Epidemiological Studies-Depression questionnaire (CES-D) (range 0-60, higher score indicates more signs of depression) [42]. Pain catastrophizing was measured using the Pain Catastrophizing Scale (PCS) (range 0-52, higher score indicates more pain catastrophizing) [43]. Beliefs and attitudes towards back pain was measured using the Back Beliefs Questionnaire (BBQ) (range 9-45, higher score indicates more positive beliefs) [44]. Start Back Screening Tool was used to assess prognostic risk profiles [45]. Expectations of recovery from back

pain within the next 3 months was assessed with a five-point scale, with the categories “Fully recovered”, “Much better”, “No difference”, “Much worse”, and “Worse than ever”.

Clinical variables

Pain with active movements was assessed for forward flexion, lateral flexion and rotation of the back. Physical performance with focus on trunk mobility was assessed with the 6-item Back Performance Scale (BPS) (range 0-18, higher score indicates worse trunk mobility performance) [46]. Walking function was assessed with the Timed-Up-and-Go (TUG) [47]. Signs of radiculopathy was measured using a clinical diagnostic model that summarizes five items: Subjective sensory changes (1 point), radiating pain below the knee (2 points), leg pain worse than back pain (2 points), positive neural tension test (3 points) and neurological deficit of myotome, dermatome or reflexes in the lower limb (2 points) [48]. A score of ≥5/10 has been shown to indicate >80% probability of radiculopathy [48]. Twelve red flags were assessed: Cancer, first episode of back pain, constant pain, unexplained weight loss, systemically unwell, fever, urinary retention or loss of bladder control, age ≥75 years, trauma cause of back pain, osteoporosis, cortisone use and severe morning stiffness.

Statistical analyses

All analyses were performed using the IBM SPSS Statistics version 26 for Windows (IBM Corporation, Armonk, NY, USA). To handle missing data, five multiple imputation datasets with 10 iterations were created using regression estimation, and the pooled estimates are presented in this study. Patient characteristics were described with counts and percentages for categorical variables, mean and standard deviation (SD) for normally distributed continuous variables and median and interquartile range (IQR) for continuous variables with a skewed distribution. Mann-Whitney U-test was used to assess differences in days between first primary care contact and inclusion to the study between primary care practitioners, and between those recruited from primary care and those recruited from media advertisements. Multinomial regression was used to assess the strength of the associations between patient characteristics and patient’s choice of first primary care provider. First primary care provider (GP, PT or chiropractor) was the dependent variable. The chiropractic group was the largest, and therefore chosen as the reference group. Patient characteristics were organized into five blocks, for which we created separate models: i) Sociodemographic ii) general health iii) current back pain episode and back pain history iv) psychological variables and v) clinical variables. All variables in the block were simultaneously included in the model, without univariate pre-testing. The strength of associations is expressed as odds ratios (OR) with 95% confidence intervals (CI). We considered our study as exploratory, so no correction for multiple testing was performed [49]. P-values <0.05 were thus considered statistically significant. All tests were two-sided.

Assessment of generalizability

Because of economic and practical reasons, we were unable to collect data on eligible participants that declined to participate or for other reasons were not invited. Therefore, we performed a descriptive comparison of the BACE-N on age, sex, nationality, educational level, work status, marital status, BMI, alcohol use, HR-QoL, depression and walking distance with individual data from a subsample from the study "The Norwegian study on life course, ageing and generation (NORLAG)" [50, 51]. This study used a random sampling strategy in the general population and included 11028 participants. The subsample (NORLAG MSK) consisted of 794 participants collected in 2017. The participants of the subsample were ≥55 years of age and had at least one musculoskeletal complaint.

Sensitivity analyses

We performed two sensitivity analyses: 1) To assess possible bias introduced by the multiple imputation procedure, the multiple multinomial regression analyses were performed on complete case data. 2) Because PT services became available through direct access in Norway from 01.01.2018, characteristics of PT patients recruited before and after 01.01.2018 were compared using individual sample t-tests or Mann-Whitney U-tests for continuous variables, and chi-square tests for categorical variables. Results from the sensitivity analyses are available in supplementary material S1 and S2.

Sample size consideration

Sample size was considered for the BACE-N study as a whole, with the following criteria: Having sufficient statistical power for up to 14 variables in a multivariate logistic regression analysis using the "10 events per variable" rule [52], with an outcome prevalence of 40%, and allowing for a dropout-rate of 20%. This yielded a preferred sample size of 450 participants. As the multinomial regression models in this study includes a maximum of 8 independent variables, we expect the sample size to be sufficient.

Patient and public involvement

Patient representatives were part of the scientific board of the study and involved in designing and establishing BACE-N. Results will be disseminated to the recruiting primary care providers and the participating patients in an annual newsletter.

Results

A total of 452 patients were included in the study, 127 first visited a GP, 130 first visited a PT and 195 first visited a chiropractor. Eighteen patients were included from media advertisements. Median (IQR) number of days from first primary care contact to inclusion in the study was 7 (2-17) days. Duration from first primary care contact to inclusion in the study was significantly shorter for chiropractic patients compared to GP patients ($p<0.01$) and PT patients ($p<0.01$). There was no difference in duration from first primary care contact to inclusion between those recruited directly from primary care practices, and those recruited through media advertisements.

Patient characteristics

Missingness ranged from 0.0 to 16.8% for the variables, and total missingness was 4.4% across all values. Consult table 1 for details regarding patient characteristics. The median age of the patients was 66, around half of the patients were women, were in paid work, and had university-level education. Half of the patients had a hazardous alcohol consumption level, and nearly 60% of them were either current or previous smokers. One in six patients had experienced a fall during the last six weeks. Half of the patients had one or more comorbidities.

Most patients reported moderate levels of back pain and moderate to severe levels of back-related disability with a median (IQR) RMDQ-score of 9 (5-13). Almost 60% of the patients experienced monthly or yearly recurrences of back pain. Over 40% experienced weekly sleep problems attributable to back pain, and 70% experienced moderate to extreme morning stiffness. Two thirds of the patients had a low-risk profile according to the SBT, and only 6.6% had a high-risk profile. Expectations of recovery were generally high, with three out of four expecting to be much better or fully recovered within three months.

Associations between patient characteristics and type of first primary care provider

Table 2 presents the associations from the multinomial regression analyses. Patients with higher back-related disability, longer duration of symptoms, worse physical performance, probable radiculopathy, poorer HR-QoL and lower expectations of being fully recovered within the next three months were more likely to visit a GP compared to a chiropractor. Patients with widespread pain were more likely to visit a chiropractor than a GP. The characteristics strongest associated with choosing a GP versus a chiropractor were duration of symptoms, widespread pain and expectation of being fully recovered.

Patients that were older, had a longer duration of symptoms, higher back-related disability, moderate morning stiffness, higher levels of pain catastrophizing, physical performance, lower

expectations of being fully recovered within the next three months were more likely to visit a PT compared to a chiropractor. Patients in the SBT medium risk group were more likely to visit a chiropractor compared to a PT. The characteristics strongest associated with choosing a PT versus a chiropractor were duration of symptoms and expectation of being fully recovered.

Gender, education level, marital status, employment status, comorbidities, back pain severity, sleep problems, kinesiophobia, depressive signs, back beliefs, red flags, pain on active range of motion and Timed Up and Go-scores were not associated with type of primary care provider.

Assessment of generalizability

The BACE-N study sample had more men (48% versus 36.3% in NORLAG MSK), more participants with high educational level (44% versus 28.6% in NORLAG MSK), more participants currently in paid work (45.3% 31.6% in NORLAG MSK), and more participants living with a partner (76.8% versus 62.2% in NORLAG MSK). Age, nationality, alcohol consumption, BMI, depressive signs, HR-QoL and walking distance were similar between BACE-N and NORLAG MSK.

Discussion

This study showed that nearly all older patients with back pain had experienced back pain previously, and for most patients this episode was the latest of a series of annually or monthly recurring episodes. This is in accordance with several studies on back pain trajectories, where episodic or fluctuating pain was shown to be common both in the short and long term [53-56]. Further, patients with more severe back-related disability and other symptoms and signs were overall more likely to visit a GP or a physiotherapist than a chiropractor. Contrary to this finding, patients with widespread pain were more likely to choose a chiropractor over a GP. This is the first study to assess associations of a broad range of patient characteristics and choice of first primary care provider in an older population.

The burden of back pain and psychological profile were comparable between younger Norwegian back pain cohorts and the older BACE-N sample [57, 58]. The characteristics of the included patients in this study was largely comparable to the BACE-study from the Netherlands [12, 59], with a few exceptions. Both in our total study sample and our GP subsample, a larger proportion of patients had paid work, fewer experienced their first episode of back pain, and they reported lower levels of kinesiophobia and pain catastrophizing compared to the Dutch study sample. When comparing our results to the Brazilian BACE-study [12, 60], the Brazilian study had a higher proportion of women.

Further, our study sample had more patients in paid work, more patients with hazardous alcohol consumption patterns, more smokers, the patients had fewer comorbidities, lower levels of back-related disability and back pain severity, kinesiophobia, depression signs, and pain catastrophizing compared to the Brazilian BACE-sample. These differences between populations within the BACE consortium might be explained in part by minor differences in recruitment strategies in the different countries [12] or differences in how primary care is organized in the different countries. In the Netherlands, patients were recruited exclusively from a GP setting [59], whereas in Brazil patients were recruited from primary care centres or health centres specialized in geriatrics [60]. Another possible explanation may be cultural differences in the expression and interpretation of and coping with pain [61].

In line with previous research on healthcare utilization for back pain in younger populations [18, 20-22, 24-27], our results suggest that patients with "less complex" characteristics were more likely to visit a chiropractor compared to a GP or a physiotherapist. Unsurprisingly, studies using bivariate analyses [17, 19, 22, 24, 27, 28] to compare the provider groups find more significant associations or differences than studies using multivariate analyses [18, 20, 21, 25, 26]. However, regardless of statistical approach, these studies suggest that patients who seek chiropractic care have an overall lower burden of back pain compared to patients seeking GP or PT care [17-22, 24]. One notable exception is the study of Eklund et al. [23], which found that Swedish chiropractic patients had more pain and worse psychological and behavioural characteristics compared to a sample of sick-listed primary care (specific provider unknown) patients at high risk for chronicity. Our finding showing that patients with widespread pain were more likely to choose a chiropractor over a GP was contrary to the general pattern of chiropractic patients being less "complex." To the best of our knowledge, no previous studies have compared prevalence of widespread pain in the two populations, but one study showed that GP patients had more musculoskeletal comorbidities [24], possibly implying more widespread pain. Two previous studies found an association between higher age and odds of seeking care from a physiotherapist compared to a chiropractor [25, 26], in line with our results.

Many of the patient characteristics associated with choice of primary care provider in this study have previously been found to be significant prognostic factors for the persistent back-related disability and back pain in older people. For example, duration of back pain and expectation of improvement [62-67], and higher levels of back-related disability [63-68], are consistently reported as significant prognostic factors for a poor outcome of a back pain episode. A few studies in older people have found that single symptoms of neurological involvement such as leg pain below the knee, and the diagnosis of spinal stenosis were prognostic factors for the outcome of a back pain episode [62, 65].

We combined single symptoms of neurological involvement into a compound measure, but it is likely that older patients with radiculopathy have worse outcomes than those without radiculopathy. Although slightly different from widespread pain, the presence of multi-site pain has also in some studies been found to be a prognostic factor for the outcome of back pain in older adults [65, 69]. The impact of pain catastrophizing on the clinical course of back pain is less clear in older adults [64, 67] compared to younger populations [70], but it is not unreasonable to believe that pain catastrophizing may be a prognostic factor for back pain in older adults. Thus, the associations between potential prognostic factors and choice of first primary care provider imply that we can expect the clinical course of patients in the three primary care groups to be different.

The results of this study need to be viewed with consideration of some limitations. We instructed the recruiting primary care providers to invite consecutive patients, but because of obvious time constraints in clinical practice we could not ask them to keep record of how many declined to participate, nor of eligible patients that were not invited. This recruitment strategy increases the risk of selection bias, and thus could reduce the external validity of the study. To compensate for this limitation, we compared the BACE-N sample with the NORLAG MSK subsample. The characteristics of the two samples were largely comparable, but BACE-N has more men, more participants with higher education, more in paid work, and more living with their partner. Sex and education level have previously been shown to be associated with back pain severity and back-related disability in older adults [12, 13]. Thus, it may be possible that the levels of back pain and back-related disability presented in this study are slightly underestimated. The NORLAG MSK subsample is sampled from the general population, which may not be representative of those who seek care. However, the most important determinants of care-seeking for back pain seems to be pain severity and disability levels [71]. We therefore believe the assessment to be justified.

Another limitation may be the analysis strategy. We chose to keep the variables in the five blocks to provide a broad assessment of the differences in case-mix in the three primary care settings. To limit the number of statistical tests performed, univariate pre-testing and testing a “final model” across blocks were avoided. Furthermore, a different organization of the variables, for example strictly adhering to the biopsychosocial model [72] or Andersen’s behavioural model of health services use [73], may have yielded slightly different results. However, our results are largely supported by previous studies, so the potential differences because of analysis strategy or variable organization may be negligible. A third limitation is that we were unable to examine some possibly important determinants for healthcare use, such as access to different providers, patient’s familiarity with providers, the patient’s economic situation and social network referrals [73-75]. Including these

factors would have given an even broader overview of associations between individual and contextual characteristics and choice of primary care provider and suggest that future research focus on examining the contextual and social factors associated with healthcare service use.

Conclusion

We found that nearly all older adults with back pain seeking primary care had experienced back pain previously, and recurring episodes were common. In general, patients with more severe back-related disability and other clinical symptoms and signs were more likely to visit a GP or a physiotherapist than a chiropractor. Our results suggest that important patient characteristics are associated with older adult's choice of primary care providers due to back pain, which may affect the clinical course of back pain for these patients. The findings highlight the need for caution with generalization of study results across primary care populations. This is an important consideration for healthcare providers, for the development and implementation of clinical practice guidelines, and for regulators when developing primary care pathways for back pain. Further research is needed in assessing if the choice of primary care provider affects future care pathways and the clinical course of back pain in older adults.

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Author contributions:

ØNV: Study design, data collection, data analyses, manuscript draft. KS: Study design, data interpretation, critical revision. RMK: Data collection, data interpretation, critical revision. MCS: Statistical advisor, data interpretation, critical revision. MG: Principal investigator, study design, data interpretation, critical revision.

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Competing interests

The authors declare no competing interests.

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Tables:

Table 1: Baseline characteristics of study participants*

	Missing, n (%)	Total (n=452)	GP (n=127)	PT (n=130)	Chiro (n=195)
Sociodemographic variables					
Age, median (IQR)	0 (0.0)	66 (59-72)	67 (60-73)	68 (63-74)	63 (58-71)
Female, n (%)	0 (0.0)	235 (52.0)	74 (58.3)	70 (53.8)	89 (46.1)
Marital status	19 (4.2)				
Married or living with partner, n (%)		347 (76.8)	90 (70.1)	98 (74.6)	158 (81.0)
Employment status	5 (1.1)				
Currently in paid work, n (%)		212 (45.3)	57 (43.3)	49 (31.5)	106 (55.9)
Educational level, n (%)	20 (4.4)				
Low (elementary + high school)		253 (56.0)	72 (56.7)	70 (55.1)	110 (56.4)
High (university level)		199 (44.0)	55 (43.3)	60 (44.9)	85 (43.6)
General health variables					
Health-related quality of life (SF-36 0-100)	41 (9.1)				
Mental sumscore, mean (SD)		52.5 (10.0)	50.5 (11.5)	53.4 (10.0)	53.2 (8.8)
Physical sumscore, mean (SD)		41.4 (8.4)	40.0 (7.9)	40.6 (8.0)	42.8 (8.9)
Hazardous alcohol consumption (AUDIT-C^), n (%)	59 (13.1)	228 (50.4)	65 (51.1)	65 (50.0)	98 (50.2)
Smoking status, n (%)	22 (4.9)				
Current smoker		63 (13.9)	21 (16.5)	13 (10.0)	28 (14.3)
Previous		203 (44.9)	59 (46.4)	60 (46.2)	84 (43.1)
Never		186 (41.2)	47 (37.0)	57 (43.8)	83 (42.6)
Number of comorbidities (SCQ 0-15), median (IQR)	18 (4.0)	1 (1-2)	1 (0-2)	2 (1-2)	1 (1-5)
BMI, mean (SD)	14 (3.1)	27.6 (4.7)	27.6 (4.5)	27.5 (4.7)	27.7 (4.8)
Fall last 6 weeks, n (%)	24 (5.3)	73 (16.1)	13 (10.2)	24 (18.4)	35 (18.2)
Falls self-efficacy (FESI 16-64), mean (SD)	48 (10.6)	21.8 (6.0)	22.4 (6.3)	22.2 (6.1)	21.1 (5.7)
Widespread pain, n (%)	16 (3.5)	33 (7.3)	5 (4.0)	7 (5.3)	21 (10.8)
Current back pain and back pain history variables					
Previous back pain, n (%)	58 (12.8)				
Monthly		127 (28.1)	42 (33.1)	46 (35.4)	40 (20.5)
Every year		174 (38.5)	45 (35.4)	44 (33.8)	86 (44.1)
Every 1-5 years		90 (19.9)	26 (20.5)	19 (14.6)	45 (23.1)
Every five years		45 (10.0)	10 (7.9)	16 (12.3)	20 (10.3)
Only once		15 (3.3)	4 (3.1)	6 (4.6)	4 (2.1)
Back pain location of current episode, n (%)	11 (2.4)				
Thoracic only		19 (4.2)	4 (3.1)	7 (5.4)	8 (4.1)
Lumbar only		382 (84.5)	106 (83.5)	109 (83.8)	167 (85.6)
Both		51 (11.3)	17 (13.4)	14 (10.8)	20 (10.3)
Duration of current episode, n (%)	76 (16.8)				
0-6 weeks		297 (65.7)	74 (58.3)	67 (51.5)	156 (80.0)
6 weeks to 3 months		59 (13.1)	22 (17.3)	21 (16.2)	16 (8.2)
3 months or over		96 (21.2)	31 (24.4)	42 (32.3)	23 (11.8)
Back pain severity (NRS 0-10), mean (SD)	31 (6.9)	5.4 (2.3)	5.7 (2.2)	5.1 (2.3)	5.4 (2.4)
Back-related disability (RMDQ 0-24), median (IQR)	45 (10.0)	9 (5-13)	10 (6-14)	9 (6-13)	8 (3-13)
Sleep problems due to back pain, n (%)	24 (5.3)				
Weekly		189 (41.8)	60 (47.2)	49 (37.7)	80 (41.0)
Less than weekly		263 (58.2)	67 (52.8)	81 (62.3)	115 (59.0)
Morning stiffness, n (%)	26 (5.8)				
Significant or extreme		178 (39.3)	47 (37.0)	51 (39.2)	81 (41.5)
Moderate		144 (31.9)	44 (34.6)	48 (36.9)	51 (26.2)
Some or none		130 (28.8)	36 (28.3)	31 (23.9)	63 (32.3)
Psychological variables					
Kinesiophobia (FABQ-PA 0-24), median (IQR)	18 (4.0)	10 (5-14)	11 (6-14)	10 (5-15)	9 (3-13)
Depression (CES-D 0-60), median (IQR)	57 (12.6)	8 (4-15)	10 (4-17)	8.5 (4-15)	7 (4-13)
Pain catastrophizing (PCS 0-52), median (IQR)	35 (7.7)	10 (4-16)	11 (5-18)	12 (5-18)	7 (3-14)
Back beliefs (BBQ 9-45), mean (SD)	57 (12.6)	29.8 (7.0)	28.0 (6.9)	29.3 (7.2)	31.3 (6.7)
Expectations for back pain next 3 months, n (%)	19 (4.2)				

Fully recovered		115 (25.4)	19 (15.0)	24 (18.5)	72 (36.9)
Much better		226 (50.0)	66 (52.0)	71 (54.6)	89 (45.6)
No change or worse		111 (24.6)	42 (33.0)	35 (26.9)	33 (16.9)
Start Back Screening Tool risk profiles, n (%)	31 (6.9)				
Low		297 (65.7)	72 (56.7)	92 (70.8)	133 (68.2)
Medium		125 (27.7)	38 (29.9)	32 (24.6)	55 (28.2)
High		30 (6.6)	16 (12.6)	6 (4.6)	8 (4.1)
Clinical variables					
Physical performance (BPS 0-18), median (IQR)	20 (4.4)	5 (2-8)	7 (3-9)	5 (3-8)	4 (1-7)
Timed up and go, mean seconds (SD)	7 (1.5)	8.0 (2.5)	8.2 (3.0)	8.3 (2.3)	7.8 (2.2)
Positive diagnostic rule for radiculopathy, n (%)	38 (8.4)	99 (22.0)	37 (29.1)	31 (23.8)	31 (15.9)
Number of red flags (0-12), median (IQR)	50 (11.0)	1 (0-2)	1 (0-2)	1 (0-2)	1 (0-1)
Pain on active range of motion, n (%)	9 (2.0)	295 (65.3)	86 (67.7)	88 (67.7)	120 (61.5)

GP: General practitioner; PT: Physiotherapist; Chiro: Chiropractor; IQR: Interquartile range; SD: Standard deviation; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
* The presented characteristics are pooled estimates based on multiple imputation procedures
^ AUDIT-C scores of ≥3/12 for women and ≥4/12 indicates hazardous alcohol consumption

Table 2: Multinomial regression analyses; multivariate associations between patient characteristics and choice of healthcare provider (dependent variable) *

	GP (n=127)		PT (n=130)	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
Block i) Sociodemographic variables				
Age	1.03 (0.99, 1.07)	0.11	1.04 (1.00, 1.08)	**0.03**
Gender				
Female	1.53 (0.96, 2.45)	0.07	1.33 (0.83, 2.12)	0.24
Male (ref.)	1.00		1.00	
Marital status				
Married/cohabiting	0.67 (0.38, 1.19)	0.17	0.90 (0.51, 1.61)	0.73
Not married/cohabiting (ref.)	1.00		1.00	
Educational level				
Higher education	1.02 (0.64, 1.62)	0.94	1.08 (0.68, 1.73)	0.73
Lower education (ref.)	1.00		1.00	
Employment status				
Currently in paid work	0.86 (0.46, 1.62)	0.64	0.55 (0.30, 1.01)	0.05
No paid work (ref.)	1.00		1.00	
Block ii) General health variables				
Hazardous alcohol intake (AUDIT-C)				
Yes	1.20 (0.73, 1.97)	0.47	1.08 (0.64, 1.81)	0.77
No (ref.)	1.00		1.00	
Smoking status				
Yes	1.18 (0.56, 2.46)	0.67	0.64 (0.28, 1.48)	0.29
Previously	1.31 (0.77, 2.23)	0.32	1.11 (0.67, 1.83)	0.70
No (ref.)	1.00		1.00	
Health-related quality of life (SF-36, 0-100)				
Physical component	0.96 (0.93, 1.00)	**0.03**	0.98 (0.95, 1.01)	0.19
Mental component	0.97 (0.95, 1.00)	**0.02**	1.01 (0.98, 1.03)	0.73
BMI	0.98 (0.93, 1.04)	0.53	0.97 (0.92, 1.02)	0.28
Comorbidities (SCQ, 0-15)	1.07 (0.86, 1.33)	0.53	1.15 (0.95, 1.40)	0.17
Widespread pain				
Yes	0.22 (0.06, 0.81)	**0.02**	0.46 (0.18, 1.16)	0.10
No (ref.)	1.00		1.00	
Falls self-efficacy (FES-I, 16-64)	1.00 (0.95, 1.05)	0.98	1.03 (0.95, 1.05)	0.32
Block iii) Current back pain and back pain history variables				
Back pain severity (NRS, 0-10)	1.02 (0.91, 1.14)	0.77	0.90 (0.80, 1.01)	0.08
Back-related disability (RMDQ, 0-24)	1.06 (1.00, 1.12)	**0.04**	1.07 (1.01, 1.13)	**0.02**
Duration				
Over 3 months	2.92 (1.28, 6.66)	**0.01**	4.57 (1.99, 10.50)	**<0.01**
6 weeks to 3 months	3.03 (1.27, 4.97)	**0.02**	3.17 (1.28, 7.84)	**0.01**
0-6 weeks (ref.)	1.00		1.00	

Morning stiffness				
Significant or extreme	0.76 (0.41, 1.42)	0.39	1.21 (0.64, 2.30)	0.55
Moderate	1.37 (0.74, 2.56)	0.32	2.03 (1.08, 3.81)	**0.03**
A little or none (ref.)	1.00		1.00	
Sleep problems attributable to back pain				
Weekly	1.09 (0.63, 1.89)	0.76	0.75 (0.41, 1.35)	0.33
Less than weekly (ref.)	1.00		1.00	
Previous back pain frequency				
Yearly	1.11 (0.65, 1.92)	0.70	1.00 (0.59, 1.69)	0.99
Not yearly (ref.)	1.00		1.00	
Block iv) Psychological variables				
Fear-avoidance (FABQ-PA, 0-24)	1.02 (0.97, 1.07)	0.38	1.03 (0.98, 1.08)	0.20
Pain catastrophizing (PCS, 0-52)	1.03 (0.99, 1.07)	0.10	1.06 (1.02, 1.10)	**<0.01**
Depression symptoms (CESD, 0-60)	0.99 (0.95, 1.02)	0.44	0.99 (0.96, 1.03)	0.68
Back beliefs (BBQ, 9-45)	0.97 (0.93, 1.01)	0.22	0.99 (0.95, 1.03)	0.67
Expectation for back pain in 3 months				
Recovered	0.27 (0.13, 0.57)	**<0.01**	0.38 (0.19, 0.79)	**0.01**
Much better	0.65 (0.35, 1.21)	0.18	0.85 (0.46, 1.56)	0.60
No change or worse (ref.)	1.00		1.00	
Start Back Screening tool risk category				
High risk	1.65 (0.52, 5.24)	0.40	0.29 (0.08, 1.10)	0.07
Medium risk	0.97 (0.52, 1.80)	0.92	**0.52 (0.28, 0.97)**	**0.04**
Low risk (ref.)	1.00		1.00	
Block v) Clinical variables				
Number of red flags (0-12)	1.25 (0.99, 1.58)	0.06	1.19 (0.96, 1.48)	0.12
Diagnostic tool for radiculopathy				
Positive	1.94 (1.08, 3.47)	**0.03**	1.52 (0.85, 2.73)	0.16
Negative (ref.)	1.00		1.00	
Pain on active range of motion				
Yes	0.95 (0.57, 1.58)	0.85	1.09 (0.67, 1.80)	0.72
No (ref.)	1.00		1.00	
Trunk mobility performance (BPS, 0-18)	1.16 (1.08, 1.24)	**<0.01**	1.07 (1.00, 1.15)	**0.04**
Timed Up and Go, mean seconds	0.93 (0.83, 1.04)	0.20	1.00 (0.90, 1.11)	0.93

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.

* The multinomial regression analyses are based on pooled estimates from multiple regression analyses

The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.

The chiropractic group (n=195) was the reference dependent variable.

Models were built block-wise within the five blocks: i) sociodemographic ii) general health iii) current episode and back pain history iv) psychological and v) clinical. All variables were included simultaneously.

SUPPLEMENTARY FILE

Table of Contents

Sensitivity analyses S1, complete case analyses:

Methods:

Multiple multinomial regression. One model per variable block.

The total number of available cases per category will vary with number of missing for each block, and is thus shown for each block.

Results:

See Table S1 for details. No substantial changes in point estimates were detected in the multinomial regression analyses when comparing complete cases analyses to the pooled imputed estimates. There were, however, some changes in p-values. In the complete case analyses, age and being in the SBT medium risk group were not significantly associated with choosing a PT compared to a chiropractor. Further, in the complete case analyses, having more red flags were significantly associated with choosing a GP compared to a chiropractor.

Table S1: Complete case analyses of multiple multinomial regression analyses. Chiropractic group is the reference group.

Block i) Sociodemographic factors. Chiropractor n=181				
	GP (n=113) Odds ratio (95% CI)	p-value	Physio (n=108) Odds ratio (95% CI)	p-value
Age	1.03 (0.99, 1.08)	0.11	1.03 (0.99, 1.07)	0.14
Gender				
Female	1.33 (0.81, 2.17)	0.26	1.40 (0.85, 2.33)	0.19
Male (ref)	1.00		1.00	
Marital status				
Married/cohabiting	0.66 (0.37, 1.19)	0.17	0.92 (0.49, 1.72)	0.79
Not married/cohabiting (ref)	1.00		1.00	
Educational level				
Higher education	1.02 (0.63, 1.65)	0.95	1.08 (0.66, 1.77)	0.77
Lower education (ref)	1.00		1.00	
Employment status				
Currently in paid work	0.96 (0.50 1.86)	0.91	0.53 (0.27, 1.03)	0.06
No paid work (ref)	1.00		1.00	
Block ii) General health factors. Chiropractor n=155				
	GP (n=92) Odds ratio (95% CI)	p-value	Physio (n=89) Odds ratio (95% CI)	p-value
Hazardous alcohol intake (AUDIT-C)				
Yes	1.23 (0.70, 2.15)	0.48	1.67 (0.95, 2.92)	0.07
No (ref)	1.00		1.00	
Smoking				
Yes	1.37 (0.57, 3.26)	0.48	0.63 (0.22, 1.76)	0.37
Previously	1.47 (0.82, 2.66)	0.20	1.43 (0.81, 2.54)	0.22
No (ref)	1.00		1.00	
Health-related quality of life (SF-36, 0-100)				
Physical component	0.96 (0.92, 0.99)	**0.03**	0.97 (0.94, 1.01)	0.96
Mental component	0.95 (0.92. 0.98)	**0.002**	1.00 (0.94, 1.07)	0.99
BMI	0.99 (0.93, 1.06)	0.81	1.00 (0.94, 1.07)	0.99
Comorbidities (SCQ, 0-15)	1.02 (0.81, 1.29)	0.88	1.12 (0.89, 1.41)	0.33
Widespread pain				
Yes	0.16 (0.03, 0.79)	**0.03**	0.50 (0.15, 1.67)	0.26
No (ref)				
Falls self-efficacy (FESI, 16-64)	0.99 (0.93, 1.05)	0.73	0.99 (0.93, 1.06)	0.77
Block iii) Current episode and back pain history. Chiropractor n=134				
	GP (n=80) Odds ratio (95% CI)	p-value	Physio (n=92) Odds ratio (95% CI)	p-value

Back pain severity (NRS, 0-10)	1.06 (0.91, 1.22)	0.49	0.94 (0.82, 1.08)	0.40
Back-related disability (RMDQ, 0-24)	1.06 (0.99, 1.13)	0.12	1.06 (0.99, 1.13)	0.11
Duration				
Over 3 months	5.49 (2.34, 12.85)	**0.000**	9.00 (4.03, 20.13)	**0.000**
6 weeks to 3 months	4.92 (1.92, 12.61)	**0.001**	4.90 (1.91, 12.56)	**0.001**
0-6 weeks (ref)	1.00		1.00	
Morning stiffness				
Significant or extreme	1.02 (0.47, 2.24)	0.96	1.23 (0.57, 2.67)	0.60
Moderate	1.92 (0.88, 4.22)	0.10	2.36 (1.09, 5.14)	**0.03**
A little or none (ref)	1.00		1.00	
Sleep problems attributable to back pain				
- Weekly	0.82 (0.42, 1.62)	0.57	0.77 (0.39, 1.52)	0.45
- Less than weekly (ref)	1.00		1.00	
Previous back pain frequency				
- Yearly	1.06 (0.57, 1.96)	0.57	1.07 (0.58, 1.99)	0.82
- Not yearly (ref)	1.00		1.00	
Block iv) Psychological factors. Chiropractor n=155				
	GP (n=96)		Physio (n=94)	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
Fear-avoidance (FABQ-PA, 0-24)	1.03 (0.98, 1.09)	0.25	1.03 (0.98, 1.09)	0.24
Pain catastrophizing (PCS, 0-52)	1.01 (0.96, 1.05)	0.82	1.06 (1.02, 1.11)	**0.01**
Depression symptoms (CESD, 0-60)	1.00 (0.95, 1.04)	0.88	0.99 (0.95, 1.04)	0.70
Back beliefs (BBQ, 9-45)	0.97 (0.92, 1.02)	0.23	0.99 (0.94, 1.04)	0.61
Expectation for back pain in 3 months				
Recovered	0.24 (0.11, 0.54)	**0.01**	0.43 (0.19, 0.96)	**0.04**
Much better	0.57 (0.29, 1.13)	0.11	0.83 (0.41, 1.67)	0.60
No change or worse(ref)	1.00		1.00	
Start Back Screening tool				
High risk	3.41 (0.69, 16.94)	0.13	0.21 (0.03, 1.72)	0.14
Medium risk	1.26 (0.65, 2.46)	0.50	0.51 (0.25, 1.03)	0.06
Low risk (ref)	1.00		1.00	
Block v) Clinical variables. Chiropractor n=159				
	GP (n=105)		Physio (n=110)	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
Number of red flags (0-12)	1.30 (1.02, 1.67)	**0.04**	1.26 (0.99, 1.60)	0.06
Nerve involvement diagnostic tool				
Positive	2.34 (1.27, 4.31)	**0.01**	1.70 (0.93, 3.14)	0.09
Negative (ref)	1.00		1.00	
Pain on active range of motion				
Yes	0.76 (0.43, 1.32)	0.33	0.92 (0.54, 1.58)	0.77
No (ref)	1.00		1.00	
Trunk mobility performance (BPS, 0-18)	1.19 (1.10, 1.29)	**0.000**	1.10 (1.02, 1.19)	**0.01**
Timed up and go, mean seconds	0.90 (0.79, 1.03)	0.14	1.00 (0.88, 1.13)	0.94

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale tInternational; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire tPhysical Activity subscale; CES-D: Center for Epidemiological Studies tDepression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.

Sensitivity analyses S2, physiotherapy patients:

Analyses of differences between physiotherapy patients recruited before 01.01.2018 and after 01.01.2018. After 01.01.2018, there was direct access to physiotherapy in Norway, which potentially could change the population characteristics.

Methods:

- Univariate analyses corresponding to measurement level and distribution: Chi square test or for categorical variables, individual sample t-test for normally distributed continuous variables, Mann Whitney U-test for continuous variables with a skewed distribution
- We used the pooled estimates from multiple imputation that were used in the article table 1 and 2

Results:

See Table S2 for details. We found statistically significant differences between PT patients recruited before and after 01.01.2018 on the BBQ and BPS. PT patients recruited before 01.01.2018 held significantly more optimistic beliefs about back pain, with a mean (SD) BBQ score of 30.3 (6.8) for patients recruited before 01.01.2018 compared to 27.3 (7.5) for patients recruited after 01.01.2018 (p=0.03). PT patients recruited before 01.01.2018 had significantly better trunk mobility performance, with a median (IQR) of 5 (2-7) for patients recruited before 01.01.2018 compared to 7 (4-9.75) for patients recruited after 01.01.2018 (p=0.003).

Table S2: Univariate analyses of differences between physiotherapy patients recruited before and after 01.01.2018.

	Physio before (n=90)	Physio after (n=40)	p-value
Age, median (IQR)	68 (62.75, 73)	68.5 (61.5, 76)	0.323
Sex female, n (%)	53 (58.9)	17 (42.5)	0.084
Married or living with partner, n (%)	69 (76.7)	29 (72.5)	0.580
Paid work, n (%)	30 (33.3)	12 (30.0)	0.606
Education level			0.317
- Low (elementary+high school)	51 (56.7)	19 (47.5)	
- High (university> + uni 4+)	39 (43.3)	21 (52.5)	
Health-related quality of life			
- Mental sumscore, median (IQR)	56.29 (51.01, 60.99	54.63 (47.35, 60.37)	0.396
- Physical sumscore, mean (SD)	40.61 (7.91)	40.67 (8.30)	0.969
Hazardous alcohol consumption, n (%)	44 (48.9)	21 (52.5)	0.786
Smoking status			0.202
- Current smoker	9 (10)	4 (10)	
- Previous	46 (51.1)	14 (35)	
- Never	35 (38.9)	22 (55)	
Number of comorbidities, median (IQR)	2 (1, 2.25)	1 (1, 2)	0.235
BMI, median (IQR)	26.60 (24.41, 30.47)	26.37 (24.60, 29.27)	0.913

Fall last 6 weeks, n (%)	18 (20)	7 (17.5)	0.623
Falls self-efficacy, median (IQR)	20 (18, 23.35)	22.5 (17, 26.9)	0.424
Widespread pain, n (%)	5 (5.6)	2 (5.0)	0.880
Previous back pain, n (%)			0.479
- Monthly	35 (38.9)	11 (27.5)	
- Every year	30 (33.3)	14 (35.0)	
- Every 1-5 years	13 (14.4)	5 (12.5)	
- Every five years	8 (8.9)	8 (20.0)	
- Only once	4 (4.4)	2 (5.0)	
Duration of current episode, n (%)			0.538
- 0-6 weeks	30 (33.3)	11 (27.5)	
- 6 weeks to 3 months	17 (18.9)	11 (27.5)	
- 3 months or over	43 (47.8)	19 (47.5)	
Back pain, mean (SD)	5.22 (2.53)	4.69 (1.87)	0.208
Back-related disability, RMDQ, median (IQR)	8 (6, 13)	9.5 (4.25, 14)	0.808
Sleep problems due to back pain, n (%)			0.374
- Weekly	36 (40)	13 (32.5)	
- Less than weekly	54 (60)	27 (67.5)	
Morning stiffness, n (%)			
- Significant or extreme	35 (38.9)	16 (40)	0.753
- Moderate	35 (38.9)	13 (32.5)	
- Some or none	20 (22.2)	11 (27.5)	
Walking distance, n (%)			0.285
- More than 3km	40 (44.4)	16 (40.0)	
- 200m to 3km	41 (45.6)	16 (40.0)	
- Less than 200m	9 (10)	8 (20.0)	
Kinesiophobia (FABQ-PA), median (IQR)	10 (5, 15)	10.5 (5, 14)	0.842
Depression (CES-D), median (IQR)	8 (3.75, 14)	9.5 (5.25, 17.3)	0.305
Pain catastrophizing (PCS), median (IQR)	12 (5.3, 17)	11 (4, 19.6)	0.872
Back beliefs (BBQ), mean (SD)	30.3 (6.8)	27.3 (7.5)	**0.03**
Expectations for back pain next 3 months			0.821
- Fully recovered	17 (18.9)	7 (17.5)	
- Much better	50 (55.5)	21 (52.5)	
- No change or worse	23 (25.5)	12 (30.0)	
SBT risk profiles			0.163
- Low	68 (75.5)	24 (60)	
- Medium	18 (20)	14 (35)	
- High	4 (4.4)	2 (5)	
Back performance scale, median (range)	5 (2, 7)	7 (4, 9.75)	**0.003**
Timed up and go, median (IQR)	7.99 (6.66, 9.18)	7.42 (6.64, 9.86)	0.655
Probable nerve root involvement, n (%)	20 (22.2)	13 (32.5)	0.194
Number of red flags, median (range)	1 (0, 2)	1 (0, 2)	0.815
Pain on active range of motion, n (%)	61 (67.8)	27 (67.5)	0.905

IQR: Interquartile range; SD: Standard deviation; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale tInternational; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire tPhysical Activity subscale; CES-D: Center for Epidemiological Studies tDepression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
AUDIT-C scores of [illegible]/12 for women and [illegible]/12 indicates hazardous alcohol consumption

Assessment of generalizability S3:

Table S3: Descriptive comparison of NORLAG sample and NORLAG 2017 musculoskeletal (MSK) subsample with BACE-N sample.

	NORLAG 2017 subsample MSK conditions^ (n=794)	**BACE-N (n=452)**
Age, median (IQR, range)	66 (60-74, 50-93)	66 (59-72, 55-89)
Gender female, n (%)	506 (63.7)	235 (52)
Mother tongue Norwegian (n=432), n (valid %)		412 (95.4)
Country of origin Norway, n (%)	728 (91.7)	
Educational level, n (%)		
- Low (elementary + high school)	566 (71.4)	253 (56.0)
- High (university level)	227 (28.6)	199 (44.0)
In paid work, n (%)	251 (31.6)	205 (45.3)
Living with partner, n (%)	494 (62.2)	347 (76.8)
BMI, mean (SD)	26.3 (4.4)	27.6 (4.7)
How many alcoholic units do you normally drink?~ n (valid %)		
- 1-2		
- 3-4		
- 5-6	183 (70.1)	289 (63.9)
- 7-9	62 (23.8)	136 (30.1)
- 10 or more	10 (3.8)	22 (4.8)
	1 (0.4)	2 (0.4)
	5 (1.9)	3 (0.7)
How often have you drunk alcohol until you felt intoxicated? (n=433) n, (valid %)		
- Once per week	12 (2.8)	
- 2-3 times per week	3 (0.7)	
- 2-3 times per month	18 (4.2)	
- Once per month	37 (8.5)	
- Rarely	235 (54.3)	
- Never	128 (29.6)	
How often do you drink 6 alcoholic units or more?		
- Almost daily		1 (0.2)
- Some days per week		3 (0.7)
- Some days per month		41 (9.1)
- Rarely		194 (42.9)
- Never		213 (47.1)
CES-D (IQR, range)	8 (4-14, 0-38)	8 (4-15, 0-46)
HR-QoL, physical summary score*, mean (SD)	37.5 (11.3)	41.4 (8.4)
HR-QoL, mental summary score*, mean (SD)	54.7 (8.2)	52.5 (10.0)
Walking distance		
- Cannot walk	13 (1.7)	
- A few steps	22 (2.8)	
- 10-100 m	59 (7.6)	
- 100-500m	57 (7.3)	
- 500m-1km	82 (10.5)	
- 1-5km	235 (30.1)	
- 5km+	313 (40.1)	
Walking distance		
- Less than 15m		20 (0.7)
- 15m-200m		310 (11.5)
- 200m-3km		1130 (42.1)
- 3km+		1218 (45.3)

IQR: Interquartile range; SD; Standard deviation; BMI: Body mass index; CES-D: Center for Epidemiological Studies t Depression questionnaire; HR-QoL: Health-related quality of life

^The subsample was collected in 2017 and consisted of participants aged 55 years or older, with at least one musculoskeletal condition

In BACE-N, it is the AUDIT-C question 2, a categorical question with 5 categories: 1-2, 3-4, 5-6, 7-9 and 10 or more.

*NORLAG used Short Form Health Survey-12, BACE-N used Short Form Health Survey-36

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*5-7*
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	8
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9, 19-20
		(b) Indicate number of participants with missing data for each variable of interest	9, 19-20
Outcome data	15*	Report numbers of outcome events or summary measures	9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-10, 20-21

		(*b*) Report category boundaries when continuous variables were categorized	6-7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10, suppl.
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Characteristics of older adults with back pain associated with choice of first primary care provider: a cross-sectional analysis from the BACE-N cohort study

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Article title:

Characteristics of older adults with back pain associated with choice of first primary care provider: a cross-sectional analysis from the BACE-N cohort study

Authors:
Ørjan Nesse Vigdal[1]

Kjersti Storheim[2,1]

Rikke Munk Killingmo[1]

Milada C. Småstuen[1]

Margreth Grotle[1,2]

Author affiliations:

[1]Department of Physiotherapy, Faculty of Health Science, OsloMet - Oslo Metropolitan University, Oslo, Norway

[2]Research and Communication Unit for Musculoskeletal Health (FORMI), Division of Clinical Neuroscience, Oslo University Hospital, Oslo, Norway

Corresponding author:
Ørjan Nesse Vigdal

E-mail address: orvig@oslomet.no
Mailing address: OsloMet – Oslo Metropolitan University, Post box 4, St.Olavs plass, 0130 Oslo, Norway
Telephone number: +47 414 59 314

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Abstract

Objectives: To describe characteristics of older adults with back pain in primary care, and to assess associations between patient characteristics and type of first primary care provider (general practitioner (GP), physiotherapist (PT) or chiropractor).

Design: Cross-sectional analysis from the BACE-N cohort study.

Setting: Norwegian GP, PT and chiropractic primary care centres.

Participants: Patients aged ≥55 years seeking Norwegian primary care with a new episode of back pain were invited to participate. Between April 2015 and February 2020, we included 452 patients: 127 first visited a GP, 130 first visited a PT and 195 first visited a chiropractor.

Primary and secondary outcome measures: For the first objective, the outcome measure was descriptive statistics of patient characteristics, covering the following domains: sociodemographic, general health, current and previous back pain, psychological and clinical factors. For the second objective, first primary care provider was the outcome measure. Associations between patient characteristics and visiting a GP or PT compared to a chiropractor were assessed with multiple multinomial regression analyses.

Results: Median (IQR) age was 66 (59-72) years. Levels of back-related disability was moderate to severe, with a median (IQR) Roland-Morris Disability Questionnaire (range 0-24) score of 9 (5-13). Recurring episodes were common, 301 (67%) patients had monthly or yearly recurrences. Patients with worse back-related disability, longer duration of symptoms, lower expectations for full recovery and worse physical performance measured with the Back Performance Scale had higher odds of visiting a GP or PT compared to a chiropractor ($p<0.05$).

Conclusion: Older back pain patients in primary care had moderate to severe levels of back-related disability, and most had recurring episodes. Our results suggest that older adult's choice of first primary care provider was associated with important patient characteristics, which highlights the need for caution with generalizations of study results across primary care populations.

Trial registration number: ClinicalTrials identifier: NCT04261309

Data availability statement

Data not available.

Keywords: Back pain, older adults, primary care, characteristics, care-seeking behaviour

Article summary

Strengths and limitations of this study

- This is the first study to compare characteristics of older adults with back pain visiting a GP, physiotherapist or chiropractor.
- This study provides a thorough comprehensive overview of older adults with back pain, and thus contributes with important knowledge in a research field with few previous studies
- It was not possible to obtain data on eligible patients that were not invited or declined to participate in the study. This might reduce external validity.

Introduction

Back pain is the number one cause of years lived with disability globally, with an estimated point prevalence of 11.9% [1, 2]. Older adults have historically been under-represented in back pain research [3, 4], but have recently received increased attention [5, 6]. Although the prevalence of pathoanatomical findings on diagnostic imaging increases with age [7-9], the prevalence of serious pathology, such as vertebral fractures and neuropathic pain in older back pain patients in primary care is low. Studies have reported a prevalence of 6% and 2-11%, respectively [10, 11]. Moreover, studies in primary care have found significant national differences in the characteristics and burden of back pain in older adults [12, 13]. This highlights the importance of caution when generalizing results from studies from one setting to another.

Most patients seeking healthcare for back pain are treated in primary care [14]. In Norway, back pain is the reason for 10%, 27% and 86% of the visits to general practitioners (GP), physiotherapists (PT) and chiropractors, respectively [15]. Some studies suggest that choice of first primary care provider has consequences for future healthcare consumption, including imaging and opioid use [16, 17]. To optimize decision making regarding treatment, research and health policies, detailed knowledge of patient populations is required. Most of the previous studies exploring patient populations seeking primary care have compared GP and chiropractic populations, showing that patients seeking care from a GP have a higher overall burden of back pain compared to chiropractic patients [18-25]. Only a few studies include PT populations [26-29]. These studies suggest that patients seeking care from PTs are older and have more disability than those seeking care from chiropractors [26, 27, 29]. To the best of our knowledge, only one study has been performed in an exclusively older population [28]. This study found that older women seeking care from GPs reported worse back pain and worse health-related quality of life than older women visiting a PT or a chiropractor [28]. The study only included women between 59-64 years of age, and it is not clear if the results are also generalizable to men or adults over 65 years of age. Further, they did not examine back-related disability or other back pain factors, sociodemographic factors, psychological factors or clinical factors. Thus, there is still a considerable lack of knowledge regarding whether characteristics of older back pain patients differ according to their choice of first primary care provider.

Therefore, the aims of this study were 1) to describe the characteristics of patients ≥55 years of age seeking primary care for a new episode of back pain in terms of sociodemographic, general health, current back pain and back pain history, psychological and clinical characteristics, and 2) to assess if patient characteristics are associated with type of first primary care provider (GP, PT or chiropractor).

Methods

Design and setting

This cross-sectional study presents baseline data from the Back Complaints in the Elders – Norway (BACE-N) study, a prospective observational cohort study in Norwegian primary care. The BACE-N study is a part of the international BACE consortium, with research groups from Brazil, the Netherlands and Australia [6]. The BACE-N study protocol has been registered in ClinicalTrials.gov (Identifier NCT04261309). The study was classified as a quality assessment study by the Norwegian Regional Committee for Medical Research Ethics (reference no. 2014/1634/REK vest) and was approved by the Norwegian Social Science Data Service in 2015 (reference no. 42149).

Norwegian primary care is organized by the municipalities and financed through the National Insurance Scheme, the municipalities, and patient co-payment [30]. There is direct access to GPs, PTs (from 2018) and chiropractors [30]. Patient co-payment rates vary between healthcare providers, with chiropractors generally having the highest co-payment cost [30]. Treatments provided usually differ between the healthcare providers. For example, patients visiting a GP is more likely to receive pharmacological therapy, patients visiting a PT is more likely to receive exercise therapy, and patients visiting chiropractors are more likely to receive manipulation therapy [15].

Participants and recruitment procedure

Eligible patients were ≥55 years of age, seeking primary care from a GP, PT or chiropractor in primary care for a new episode of back pain. Back pain was defined as pain located in the region from the top of the scapula to the sacrum, with or without radiating leg pain. A new episode was defined as not having received healthcare for the same complaint in the last six months. Patients were excluded if they had difficulties completing the questionnaire due to language barriers, or if they had difficulties completing the clinical examination (for example wheelchair-bound patients). Participants received care as usual.

Patients were recruited from GPs, PTs, and chiropractors in urban and rural parts of Norway between April 2015 and February 2020, either during or immediately after the consultation. The primary care providers were instructed to invite consecutive patients. To facilitate the recruitment process, media advertisements were also used. Eligible patients received oral and written information about the study. The final screening for eligibility and inclusion to the study was performed by the researchers. All included patients signed an informed consent form before enrolment in the study. The baseline

measurements, consisting of questionnaires and a clinical examination, were collected as soon after the first primary care consultation as possible.

Measurements

Sociodemographic variables

Information regarding age, sex, marital status, employment status and educational level were collected.

General health variables

Health-related quality of life (HR-QoL) was measured using the Short-Form Health Survey 36-item (SF-36) physical and mental summary measures (range 0-100, higher score indicates better HR-QoL) [31]. Alcohol consumption was measured using the 3-item Alcohol Use Disorder Identification Test consumption questions (AUDIT-C) (range 0-12, higher score indicates higher alcohol consumption) [32]. Hazardous alcohol consumption was defined as an AUDIT-C score of ≥3/12 for women and ≥4/12 for men [33, 34]. Smoking status (current smoker, previous smoker, non-smoker) was collected. The number of comorbidities was measured using the Self-Administered Comorbidity Questionnaire (SCQ) [35]. The SCQ has 13 pre-defined comorbidities and two optional comorbidities. Item 12, "back pain", was replaced with a third optional comorbidity. Widespread pain was measured using the pain drawing from McGill Pain Questionnaire and the revised criteria from Wolfe et al. for widespread pain [36, 37]. The number of falls during the last six weeks was collected, and falls self-efficacy was measured using the Falls Efficacy Scale-International (FES-I) (range 16-64, higher score indicated lower falls efficacy) [38].

Current back pain and back pain history

Back pain location (thoracic or lumbar, or both) was collected. Average back pain severity last week was measured using the Numeric Rating Scale (NRS) (range 0-10, higher score indicates higher back pain severity) [39]. Back-related disability was measured with the 24-item Roland-Morris Disability Questionnaire (RMDQ) (range 0-24, higher score indicated more back-related disability) [40]. Back pain duration was measured in days and categorized into "<6 weeks", "6 weeks to 3 months", and ">3 months". Frequency of previous back pain episodes (monthly, yearly, every 1-5 years, every five years, once) was collected. Sleep problems attributable to back pain were measured using item 5i from the Pittsburgh Sleep Quality Index (PSQI) [41], and dichotomized to "weekly/less than weekly". Morning stiffness was measured with item six from Knee injury and Osteoarthritis Outcome Score (KOOS) [42], where we replaced the word "knee" with "back".

Psychological variables

Kinesiophobia was measured using the Fear-Avoidance Beliefs Questionnaire-Physical Activity subscale (FABQ-PA) (range 0-24, higher score indicates higher levels of kinesiophobia) [43]. Signs of depression were measured with the Center for Epidemiological Studies-Depression questionnaire (CES-D) (range 0-60, higher score indicates more signs of depression) [44]. Pain catastrophizing was measured using the Pain Catastrophizing Scale (PCS) (range 0-52, higher score indicates more pain catastrophizing) [45]. Beliefs and attitudes towards back pain was measured using the Back Beliefs Questionnaire (BBQ) (range 9-45, higher score indicates more positive beliefs) [46]. Start Back Screening Tool (SBT) was used to assess prognostic risk profiles [47]. Expectations of recovery from back pain within the next 3 months was assessed with a five-point scale, with the categories "Fully recovered", "Much better", "No difference", "Much worse", and "Worse than ever".

Clinical variables

Pain with active movements was assessed for forward flexion, lateral flexion and rotation of the back. Physical performance with focus on trunk mobility was assessed with the 6-item Back Performance Scale (BPS) (range 0-18, higher score indicates worse trunk mobility performance) [48]. Walking function was assessed with the Timed-Up-and-Go (TUG) [49]. Signs of radiculopathy was measured using a clinical diagnostic model that summarizes five items: Subjective sensory changes (1 point), radiating pain below the knee (2 points), leg pain worse than back pain (2 points), positive neural tension test (3 points) and neurological deficit of myotome, dermatome or reflexes in the lower limb (2 points) [50]. A score of ≥5/10 has been shown to indicate >80% probability of radiculopathy [50]. Twelve red flags were assessed: Cancer, first episode of back pain, constant pain, unexplained weight loss, systemically unwell, fever, urinary retention or loss of bladder control, age ≥75 years, trauma cause of back pain, osteoporosis, cortisone use and severe morning stiffness.

Statistical analyses

All analyses were performed using the IBM SPSS Statistics version 26 for Windows (IBM Corporation, Armonk, NY, USA). To handle missing data, five multiple imputation datasets with 10 iterations were created using regression estimation, and the pooled estimates are presented in this study. Patient characteristics were described with counts and percentages for categorical variables, mean and standard deviation (SD) for normally distributed continuous variables and median and interquartile range (IQR) for continuous variables with a skewed distribution. Mann-Whitney U-test was used to assess differences in days between first primary care contact and inclusion to the study between primary care practitioners, and between those recruited from primary care and those recruited from media advertisements. Multinomial regression was used to assess the strength of the associations

between patient characteristics and patient's choice of first primary care provider. First primary care provider (GP, PT or chiropractor) was the dependent variable. The chiropractic group was the largest, and therefore chosen as the reference group. Patient characteristics were organized into five blocks, for which we created separate models: i) Sociodemographic ii) general health iii) current back pain episode and back pain history iv) psychological variables and v) clinical variables. All variables in the block were simultaneously included in the model, without univariate pre-testing. The strength of associations is expressed as odds ratios (OR) with 95% confidence intervals (CI). We considered our study as exploratory, so no correction for multiple testing was performed [51]. P-values <0.05 were thus considered statistically significant. All tests were two-sided.

Assessment of generalizability

Because of economic and practical reasons, we were unable to collect data on eligible participants that declined to participate or for other reasons were not invited. Therefore, we performed a descriptive comparison of the BACE-N on age, sex, nationality, educational level, work status, marital status, BMI, alcohol use, HR-QoL, depression and walking distance with individual data from a subsample from the study "The Norwegian study on life course, ageing and generation (NORLAG)" [52, 53]. This study used a random sampling strategy in the general population and included 11028 participants. The subsample (NORLAG MSK) consisted of 794 participants collected in 2017. The participants of the subsample were ≥55 years of age and had at least one musculoskeletal complaint.

Sensitivity analyses

We performed three sensitivity analyses: 1) To assess possible bias introduced by the multiple imputation procedure, the multiple multinomial regression analyses were performed on complete case data. We included a bootstrapping approach to assess the robustness of the coefficients. 2) Because PT services became available through direct access in Norway from 01.01.2018, characteristics of PT patients recruited before and after 01.01.2018 were compared using individual sample t-tests or Mann-Whitney U-tests for continuous variables, and chi-square tests for categorical variables. 3) We performed the multiple multinomial regression analyses in the subgroup with low back pain only. Results from the sensitivity analyses are available in supplementary material S1 through S3.

Sample size consideration

Sample size was considered for the BACE-N study as a whole, with the following criteria: Having sufficient statistical power for up to 14 variables in a multivariate logistic regression analysis using the "10 events per variable" rule [54], with an outcome prevalence of 40%, and allowing for a

dropout-rate of 20%. This yielded a preferred sample size of 450 participants. As the multinomial regression models in this study includes a maximum of 8 independent variables, we expect the sample size to be sufficient.

Patient and public involvement

Patient representatives were part of the scientific board of the study and involved in designing and establishing BACE-N. Results will be disseminated to the recruiting primary care providers and the participating patients in an annual newsletter.

Results

A total of 452 patients were included in the study, 127 first visited a GP, 130 first visited a PT and 195 first visited a chiropractor. Eighteen patients were included from media advertisements. Median (IQR) number of days from first primary care contact to inclusion in the study was 13 (3-21) days for GP patients, 9 (3-21) for physiotherapy patients and 5 (1-13) for chiropractic patients. The duration was significantly shorter for chiropractic patients compared to GP patients ($p<0.01$) and PT patients ($p<0.01$). There was no statistically significant difference in duration from first primary care contact to inclusion between those recruited directly from primary care practices (median (IQR) 7 (2-15) days), and those recruited through media advertisements (median (IQR) 16 (1-28) days) ($p=0.315$).

Patient characteristics

Missingness ranged from 0.0 to 16.8% for the variables, and total missingness was 4.4% across all values. Rates of missingness was similarly distributed across the primary care provider groups. Consult table 1 for details regarding patient characteristics. The median age of the patients was 66, around half of the patients were women, were in paid work, and had university-level education. Half of the patients had a hazardous alcohol consumption level, and nearly 60% of them were either current or previous smokers. One in six patients had experienced a fall during the last six weeks. Half of the patients had one or more comorbidities.

Most patients reported moderate levels of back pain and moderate to severe levels of back-related disability with a median (IQR) RMDQ-score of 9 (5-13). Almost 70% of the patients experienced monthly or yearly recurrences of back pain. Over 40% experienced weekly sleep problems attributable to back pain, and 70% experienced moderate to extreme morning stiffness. Two thirds of the patients had a low-risk profile according to the SBT, and only 6.6% had a high-risk profile.

Expectations of recovery were generally high, with three out of four expecting to be much better or fully recovered within three months.

Associations between patient characteristics and type of first primary care provider

Table 2 presents the associations from the multinomial regression analyses. Patients with higher back-related disability, longer duration of symptoms, worse physical performance, probable radiculopathy, poorer HR-QoL and lower expectations of being fully recovered within the next three months were more likely to visit a GP compared to a chiropractor. Patients with widespread pain were more likely to visit a chiropractor than a GP. The characteristics strongest associated with choosing a GP versus a chiropractor were duration of symptoms, widespread pain and expectation of being fully recovered.

Patients that were older, had a longer duration of symptoms, higher back-related disability, moderate morning stiffness, higher levels of pain catastrophizing, worse physical performance, lower expectations of being fully recovered within the next three months were more likely to visit a PT compared to a chiropractor. Patients in the SBT medium or high risk group were more likely to visit a chiropractor compared to a PT. The characteristics strongest associated with choosing a PT versus a chiropractor were duration of symptoms and expectation of being fully recovered.

Gender, education level, marital status, employment status, comorbidities, back pain severity, sleep problems, kinesiophobia, depressive signs, back beliefs, red flags, pain on active range of motion and Timed Up and Go-scores were not associated with type of primary care provider.

Assessment of generalizability

The BACE-N study sample had more men (48% versus 36.3% in NORLAG MSK), more participants with high educational level (44% versus 28.6% in NORLAG MSK), more participants currently in paid work (45.3% versus 31.6% in NORLAG MSK), and more participants living with a partner (76.8% versus 62.2% in NORLAG MSK). Age, nationality, alcohol consumption, BMI, depressive signs, HR-QoL and walking distance were similar for BACE-N and NORLAG MSK. See supplementary material S4 for further details.

Discussion

This study showed that nearly all older patients with back pain had experienced back pain previously, and for most patients this episode was the latest of a series of annually or monthly recurring

episodes. This is in accordance with several studies on back pain trajectories, where episodic or fluctuating pain was shown to be common both in the short and long term [55-58]. Further, patients with more severe back-related disability and other symptoms and signs were overall more likely to visit a GP or a physiotherapist than a chiropractor. Contrary to this finding, patients with widespread pain were more likely to choose a chiropractor over a GP. This is the first study to assess associations of a broad range of patient characteristics and choice of first primary care provider in an older population. Older adults have previously been under-represented in back pain studies [3, 4], and the evidence underlying treatment decisions in this age group may have been over-reliant on studies performed in younger populations. Thus, this study provides evidence to improve knowledge about older adults with back pain. This may prove important for clinical guideline development and informing stakeholders aiming to improve quality of care for older adults with back pain.

The burden of back pain and psychological profile were comparable between younger Norwegian back pain cohorts and the older BACE-N sample [59, 60]. The characteristics of the included patients in this study was largely comparable to the BACE-study from the Netherlands [12, 61], with a few exceptions. Both in our total study sample and our GP subsample, a larger proportion of patients had paid work, fewer experienced their first episode of back pain, and they reported lower levels of kinesiophobia and pain catastrophizing compared to the Dutch study sample. When comparing our results to the Brazilian BACE-study [12, 62], the Brazilian study had a higher proportion of women. Further, our study sample had more patients in paid work, more patients with hazardous alcohol consumption patterns, more smokers, the patients had fewer comorbidities, lower levels of back-related disability and back pain severity, kinesiophobia, depression signs, and pain catastrophizing compared to the Brazilian BACE-sample. These differences between populations within the BACE consortium might be explained in part by minor differences in recruitment strategies in the different countries [12] or differences in how primary care is organized in the different countries. In the Netherlands, patients were recruited exclusively from a GP setting [61], whereas in Brazil patients were recruited from primary care centres or health centres specialized in geriatrics [62]. Another possible explanation may be cultural differences in the expression and interpretation of and coping with pain [63].

In line with previous research on healthcare utilization for back pain in younger populations [19, 21-23, 25-28], our results suggest that patients with “less complex” characteristics were more likely to visit a chiropractor compared to a GP or a physiotherapist. Unsurprisingly, studies using bivariate analyses [18, 20, 23, 25, 28, 29] to compare the provider groups find more significant associations or differences than studies using multivariate analyses [19, 21, 22, 26, 27]. However, regardless of

statistical approach, these studies suggest that patients who seek chiropractic care have an overall lower burden of back pain compared to patients seeking GP or PT care [18-23, 25]. One notable exception is the study of Eklund et al. [24], which found that Swedish chiropractic patients had more pain and worse psychological and behavioural characteristics compared to a sample of sick-listed primary care (specific provider unknown) patients at high risk for chronicity. Our finding showing that patients with widespread pain were more likely to choose a chiropractor over a GP was contrary to the general pattern of chiropractic patients being less "complex." To the best of our knowledge, no previous studies have compared prevalence of widespread pain in the two populations, but one study showed that GP patients had more musculoskeletal comorbidities [25], possibly implying more widespread pain. Two previous studies found an association between higher age and odds of seeking care from a physiotherapist compared to a chiropractor [26, 27], in line with our results.

Many of the patient characteristics associated with choice of primary care provider in this study have previously been found to be significant prognostic factors for the persistent back-related disability and back pain in older people. For example, duration of back pain and expectation of improvement [64-69], and higher levels of back-related disability [65-70], are consistently reported as significant prognostic factors for a poor outcome of a back pain episode. A few studies in older people have found that single symptoms of neurological involvement such as leg pain below the knee, and the diagnosis of spinal stenosis were prognostic factors for the outcome of a back pain episode [64, 67]. We combined single symptoms of neurological involvement into a compound measure, but it is likely that older patients with radiculopathy have worse outcomes than those without radiculopathy. Although slightly different from widespread pain, the presence of multi-site pain has also in some studies been found to be a prognostic factor for the outcome of back pain in older adults [67, 71]. The impact of pain catastrophizing on the clinical course of back pain is less clear in older adults [66, 69] compared to younger populations [72], but it is not unreasonable to believe that pain catastrophizing may be a prognostic factor for back pain in older adults. Thus, the associations between potential prognostic factors and choice of first primary care provider imply that we can expect the clinical course of patients in the three primary care groups to be different. Further, they imply that caution should be exercised when generalizing across primary care populations.

The results of this study need to be viewed with consideration of some limitations. We instructed the recruiting primary care providers to invite consecutive patients, but because of obvious time constraints in clinical practice we could not ask them to keep record of how many declined to participate, nor of eligible patients that were not invited. This recruitment strategy increases the risk of selection bias, and thus could reduce the external validity of the study. To compensate for this

limitation, we compared the BACE-N sample with the NORLAG MSK subsample. The characteristics of the two samples were largely comparable, but BACE-N has more men, more participants with higher education, more in paid work, and more living with their partner. Sex and education level have previously been shown to be associated with back pain severity and back-related disability in older adults [12, 13]. Thus, it may be possible that the levels of back pain and back-related disability presented in this study are slightly underestimated. The NORLAG MSK subsample is sampled from the general population, which may not be representative of those who seek care. However, the most important determinants of care-seeking for back pain seems to be pain severity and disability levels [73]. We therefore believe the assessment to be justified.

Another limitation may be the analysis strategy. We chose to keep the variables in the five blocks to provide a broad assessment of the differences in case-mix in the three primary care settings. To limit the number of statistical tests performed, univariate pre-testing and testing a "final model" across blocks were avoided. Furthermore, a different organization of the variables, for example strictly adhering to the biopsychosocial model [74] or Andersen's behavioural model of health services use [75], may have yielded slightly different results. However, our results are largely supported by previous studies, so the potential differences because of analysis strategy or variable organization may be negligible. A third limitation is that we were unable to examine some possibly important determinants for healthcare use, such as access to different providers, patient's familiarity with providers, the patient's economic situation and social network referrals [75-77]. These factors may be the most important determinants in driving the patient's choice of first primary care provider, and including these factors would have given an even broader overview of associations between individual and contextual characteristics and choice of primary care provider. We suggest that future research focus on examining the contextual and social factors associated with healthcare service use. Finally, generalization of our results to other healthcare systems may be limited. Different healthcare systems may have different access to care, different payment schemes and different professional training and responsibilities for the healthcare providers, all of which may impact health services utilization and consequently the patient characteristics associated with choosing different primary care provides [75, 78, 79].

Conclusion

We found that nearly all older adults with back pain seeking primary care had experienced back pain previously, and recurring episodes were common. In general, patients with more severe back-related disability and other clinical symptoms and signs were more likely to visit a GP or a physiotherapist than a chiropractor. Our results suggest that important patient characteristics are associated with

older adult's choice of primary care providers due to back pain, which may affect the clinical course of back pain for these patients. The findings highlight the need for caution with generalization of study results across primary care populations. This is an important consideration for healthcare providers, for the development and implementation of clinical practice guidelines, and for regulators when developing primary care pathways for back pain. Further research is needed in assessing if the choice of primary care provider affects future care pathways and the clinical course of back pain in older adults.

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Author contributions:

ØNV: Study design, data collection, data analyses, manuscript draft. KS: Study design, data interpretation, critical revision. RMK: Data collection, data interpretation, critical revision. MCS: Statistical advisor, data interpretation, critical revision. MG: Principal investigator, study design, data interpretation, critical revision.

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Competing interests

The authors declare no competing interests.

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Table 1: Baseline characteristics of study participants*

	Missing, n (%)	Total (n=452)	GP (n=127)	PT (n=130)	Chiro (n=195)
Sociodemographic variables					
Age, median (IQR)	0 (0.0)	66 (59-72)	67 (60-73)	68 (63-74)	63 (58-71)
Female, n (%)	0 (0.0)	235 (52.0)	74 (58.3)	70 (53.8)	89 (46.1)
Marital status	19 (4.2)				
Married or living with partner, n (%)		347 (76.8)	90 (70.1)	98 (74.6)	158 (81.0)
Employment status	5 (1.1)				
Currently in paid work, n (%)		212 (45.3)	57 (43.3)	49 (31.5)	106 (55.9)
Educational level, n (%)	20 (4.4)				
Low (elementary + high school)		253 (56.0)	72 (56.7)	70 (55.1)	110 (56.4)
High (university level)		199 (44.0)	55 (43.3)	60 (44.9)	85 (43.6)
General health variables					
Health-related quality of life (SF-36 0-100)	41 (9.1)				
Mental sumscore, mean (SD)		52.5 (10.0)	50.5 (11.5)	53.4 (10.0)	53.2 (8.8)
Physical sumscore, mean (SD)		41.4 (8.4)	40.0 (7.9)	40.6 (8.0)	42.8 (8.9)
Hazardous alcohol consumption (AUDIT-C^), n (%)	59 (13.1)	228 (50.4)	65 (51.1)	65 (50.0)	98 (50.2)
Smoking status, n (%)	22 (4.9)				
Current smoker		63 (13.9)	21 (16.5)	13 (10.0)	28 (14.3)
Previous		203 (44.9)	59 (46.4)	60 (46.2)	84 (43.1)
Never		186 (41.2)	47 (37.0)	57 (43.8)	83 (42.6)
Number of comorbidities (SCQ 0-15), median (IQR)	18 (4.0)	1 (1-2)	1 (0-2)	2 (1-2)	1 (1-5)
BMI, mean (SD)	14 (3.1)	27.6 (4.7)	27.6 (4.5)	27.5 (4.7)	27.7 (4.8)
Fall last 6 weeks, n (%)	24 (5.3)	73 (16.1)	13 (10.2)	24 (18.4)	35 (18.2)
Falls self-efficacy (FESI 16-64), mean (SD)	48 (10.6)	21.8 (6.0)	22.4 (6.3)	22.2 (6.1)	21.1 (5.7)
Widespread pain, n (%)	16 (3.5)	33 (7.3)	5 (4.0)	7 (5.3)	21 (10.8)
Current back pain and back pain history variables					
Previous back pain, n (%)	58 (12.8)				
Monthly		127 (28.1)	42 (33.1)	46 (35.4)	40 (20.5)
Every year		174 (38.5)	45 (35.4)	44 (33.8)	86 (44.1)
Every 1-5 years		90 (19.9)	26 (20.5)	19 (14.6)	45 (23.1)
Every five years		45 (10.0)	10 (7.9)	16 (12.3)	20 (10.3)
Only once		15 (3.3)	4 (3.1)	6 (4.6)	4 (2.1)
Back pain location of current episode, n (%)	11 (2.4)				
Thoracic only		19 (4.2)	4 (3.1)	7 (5.4)	8 (4.1)
Lumbar only		382 (84.5)	106 (83.5)	109 (83.8)	167 (85.6)
Both		51 (11.3)	17 (13.4)	14 (10.8)	20 (10.3)
Duration of current episode, n (%)	76 (16.8)				
0-6 weeks		297 (65.7)	74 (58.3)	67 (51.5)	156 (80.0)
6 weeks to 3 months		59 (13.1)	22 (17.3)	21 (16.2)	16 (8.2)
3 months or over		96 (21.2)	31 (24.4)	42 (32.3)	23 (11.8)
Back pain severity (NRS 0-10), mean (SD)	31 (6.9)	5.4 (2.3)	5.7 (2.2)	5.1 (2.3)	5.4 (2.4)
Back-related disability (RMDQ 0-24), median (IQR)	45 (10.0)	9 (5-13)	10 (6-14)	9 (6-13)	8 (3-13)
Sleep problems due to back pain, n (%)	24 (5.3)				
Weekly		189 (41.8)	60 (47.2)	49 (37.7)	80 (41.0)
Less than weekly		263 (58.2)	67 (52.8)	81 (62.3)	115 (59.0)
Morning stiffness, n (%)	26 (5.8)				
Significant or extreme		178 (39.3)	47 (37.0)	51 (39.2)	81 (41.5)
Moderate		144 (31.9)	44 (34.6)	48 (36.9)	51 (26.2)
Some or none		130 (28.8)	36 (28.3)	31 (23.9)	63 (32.3)
Psychological variables					
Kinesiophobia (FABQ-PA 0-24), median (IQR)	18 (4.0)	10 (5-14)	11 (6-14)	10 (5-15)	9 (3-13)
Depression (CES-D 0-60), median (IQR)	57 (12.6)	8 (4-15)	10 (4-17)	8.5 (4-15)	7 (4-13)
Pain catastrophizing (PCS 0-52), median (IQR)	35 (7.7)	10 (4-16)	11 (5-18)	12 (5-18)	7 (3-14)
Back beliefs (BBQ 9-45), mean (SD)	57 (12.6)	29.8 (7.0)	28.0 (6.9)	29.3 (7.2)	31.3 (6.7)
Expectations for back pain next 3 months, n (%)	19 (4.2)				
Fully recovered		115 (25.4)	19 (15.0)	24 (18.5)	72 (36.9)

Much better		226 (50.0)	66 (52.0)	71 (54.6)	89 (45.6)
No change or worse		111 (24.6)	42 (33.0)	35 (26.9)	33 (16.9)
Start Back Screening Tool risk profiles, n (%)	31 (6.9)				
Low		297 (65.7)	72 (56.7)	92 (70.8)	133 (68.2)
Medium		125 (27.7)	38 (29.9)	32 (24.6)	55 (28.2)
High		30 (6.6)	16 (12.6)	6 (4.6)	8 (4.1)
Clinical variables					
Physical performance (BPS 0-18), median (IQR)	20 (4.4)	5 (2-8)	7 (3-9)	5 (3-8)	4 (1-7)
Timed up and go, mean seconds (SD)	7 (1.5)	8.0 (2.5)	8.2 (3.0)	8.3 (2.3)	7.8 (2.2)
Positive diagnostic rule for radiculopathy, n (%)	38 (8.4)	99 (22.0)	37 (29.1)	31 (23.8)	31 (15.9)
Number of red flags (0-12), median (IQR)	50 (11.0)	1 (0-2)	1 (0-2)	1 (0-2)	1 (0-1)
Pain on active range of motion, n (%)	9 (2.0)	295 (65.3)	86 (67.7)	88 (67.7)	120 (61.5)

GP: General practitioner; PT: Physiotherapist; Chiro: Chiropractor; IQR: Interquartile range; SD: Standard deviation; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
* The presented characteristics are pooled estimates based on multiple imputation procedures
^ AUDIT-C scores of ≥3/12 for women and ≥4/12 indicates hazardous alcohol consumption

Table 2: Multinomial regression analyses; multivariate associations between patient characteristics and choice of healthcare provider (dependent variable) *

	GP (n=127) Odds ratio (95% CI)	p-value	PT (n=130) Odds ratio (95% CI)	p-value
Block i) Sociodemographic variables				
Age	1.03 (0.99-1.07)	0.11	1.04 (1.00-1.08)	**0.03**
Gender				
Female	1.53 (0.96-2.45)	0.07	1.33 (0.83-2.12)	0.24
Male (ref.)	1.00		1.00	
Marital status				
Married/cohabiting	0.67 (0.38-1.19)	0.17	0.90 (0.51-1.61)	0.73
Not married/cohabiting (ref.)	1.00		1.00	
Educational level				
Higher education	1.02 (0.64-1.62)	0.94	1.08 (0.68-1.73)	0.73
Lower education (ref.)	1.00		1.00	
Employment status				
Currently in paid work	0.86 (0.46-1.62)	0.64	0.55 (0.30-1.01)	0.05
No paid work (ref.)	1.00		1.00	
Block ii) General health variables				
Hazardous alcohol intake (AUDIT-C)				
Yes	1.20 (0.73-1.97)	0.47	1.08 (0.64-1.81)	0.77
No (ref.)	1.00		1.00	
Smoking status				
Yes	1.18 (0.56-2.46)	0.67	0.64 (0.28-1.48)	0.29
Previously	1.31 (0.77-2.23)	0.32	1.11 (0.67-1.83)	0.70
No (ref.)	1.00		1.00	
Health-related quality of life (SF-36, 0-100)				
Physical component	0.96 (0.93-1.00)	**0.03**	0.98 (0.95-1.01)	0.19
Mental component	0.97 (0.95-1.00)	**0.02**	1.01 (0.98-1.03)	0.73
BMI	0.98 (0.93-1.04)	0.53	0.97 (0.92-1.02)	0.28
Comorbidities (SCQ, 0-15)	1.07 (0.86-1.33)	0.53	1.15 (0.95-1.40)	0.17
Widespread pain				
Yes	0.22 (0.06-0.81)	**0.02**	0.46 (0.18-1.16)	0.10
No (ref.)	1.00		1.00	
Falls self-efficacy (FES-I, 16-64)	1.00 (0.95-1.05)	0.98	1.03 (0.95-1.05)	0.32
Block iii) Current back pain and back pain history variables				
Back pain severity (NRS, 0-10)	1.02 (0.91-1.14)	0.77	0.90 (0.80-1.01)	0.08
Back-related disability (RMDQ, 0-24)	1.06 (1.00-1.12)	**0.04**	1.07 (1.01-1.13)	**0.02**
Duration				
Over 3 months	2.92 (1.28-6.66)	**0.01**	4.57 (1.99-10.50)	**<0.01**

6 weeks to 3 months	3.03 (1.27-4.97)	**0.02**	3.17 (1.28-7.84)	**0.01**
0-6 weeks (ref.)	1.00		1.00	
Morning stiffness				
Significant or extreme	0.76 (0.41-1.42)	0.39	1.21 (0.64-2.30)	0.55
Moderate	1.37 (0.74-2.56)	0.32	2.03 (1.08-3.81)	**0.03**
A little or none (ref.)	1.00		1.00	
Sleep problems attributable to back pain				
Weekly	1.09 (0.63-1.89)	0.76	0.75 (0.41-1.35)	0.33
Less than weekly (ref.)	1.00		1.00	
Previous back pain frequency				
Yearly	1.11 (0.65-1.92)	0.70	1.00 (0.59-1.69)	0.99
Not yearly (ref.)	1.00		1.00	
Block iv) Psychological variables				
Fear-avoidance (FABQ-PA, 0-24)	1.02 (0.98-1.07)	0.32	1.03 (0.98-1.08)	0.22
Pain catastrophizing (PCS, 0-52)	1.04 (1.00-1.07)	0.05	1.06 (1.02-1.10)	**<0.01**
Depression symptoms (CESD, 0-60)	0.99 (0.95-1.03)	0.53	0.99 (0.96-1.03)	0.61
Back beliefs (BBQ, 9-45)	0.97 (0.93-1.02)	0.23	0.99 (0.95-1.03)	0.67
Expectation for back pain in 3 months				
Recovered	0.26 (0.12-0.56)	**<0.01**	0.39 (0.19-0.79)	**0.01**
Much better	0.65 (0.35-1.19)	0.16	0.85 (0.46-1.58)	0.61
No change or worse (ref.)	1.00		1.00	
Start Back Screening tool risk category				
Medium + high risk	1.02 (0.55-1.87)	0.95	0.49 (0.26-0.92)	**0.03**
Low risk (ref.)	1.00		1.00	
Block v) Clinical variables				
Number of red flags (0-12)	1.25 (0.99-1.58)	0.06	1.19 (0.96-1.48)	0.12
Diagnostic tool for radiculopathy				
Positive	1.94 (1.08-3.47)	**0.03**	1.52 (0.85-2.73)	0.16
Negative (ref.)	1.00		1.00	
Pain on active range of motion				
Yes	0.95 (0.57-1.58)	0.85	1.09 (0.67-1.80)	0.72
No (ref.)	1.00		1.00	
Trunk mobility performance (BPS, 0-18)	1.16 (1.08-1.24)	**<0.01**	1.07 (1.00-1.15)	**0.04**
Timed Up and Go, mean seconds	0.93 (0.83-1.04)	0.20	1.00 (0.90-1.11)	0.93

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.

* The multinomial regression analyses are based on pooled estimates from multiple regression analyses

The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.

The chiropractic group (n=195) was the reference dependent variable.

Models were built block-wise within the five blocks: i) sociodemographic ii) general health iii) current episode and back pain history iv) psychological and v) clinical. All variables were included simultaneously.

SUPPLEMENTARY FILE

Table of Contents

Sensitivity analyses S1, complete case analyses:

Methods:

Multiple multinomial regression. One model per variable block. The total number of available cases per category will vary with number of missing for each block, and is thus shown for each block. Additionally, bootstrapping was performed for n=1000 bootstrapping samples. The average bootstrapping odds ratios and their corresponding bias-corrected accelerated 95% confidence intervals (BCa 95% CI) are provided. Because of few observations in the Start Back Screening Tool high risk group, we chose to combine this group with the medium risk group.

Results:

See Table S1 for details. No substantial changes in point estimates were detected in the multinomial regression analyses when comparing complete cases analyses to the pooled imputed estimates. There were, however, some changes in p-values. In the complete case analyses, age and being in the SBT medium risk group were not significantly associated with choosing a PT compared to a chiropractor. Further, in the complete case analyses, having more red flags were significantly associated with choosing a GP compared to a chiropractor. As can be seen from the bootstrapping procedure, odds ratios and BCa 95% CIs were stable for all variables, except for the SBT high risk group. Here, the BCa 95% CIs indicate that the odds ratios cannot be trusted for this specific variable.

Table S1: Complete case analyses of multiple multinomial regression analyses. Chiropractic group is the reference group.

Block i) Sociodemographic factors. Chiropractor n=181						
	GP (n=113) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Physio (n=108) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Age	1.03 (0.99, 1.08)	0.11	1.03 (0.99, 1.08)	1.03 (0.99, 1.07)	0.14	1.03 (0.98, 1.08)
Gender						
Female	1.33 (0.81, 2.17)	0.26	1.33 (0.80, 2.09)	1.40 (0.85, 2.33)	0.19	1.40 (0.82, 2.27)
Male (ref)	1.00		1.00	1.00		1.00
Marital status						
Married/cohabiting	0.66 (0.37, 1.19)	0.17	0.66 (0.36, 1.26)	0.92 (0.49, 1.72)	0.79	0.92 (0.48, 1.68)
Not married/cohabiting (ref)	1.00		1.00	1.00		1.00
Educational level						
Higher education	1.02 (0.63, 1.65)	0.95	1.02 (0.60, 1.70)	1.08 (0.66, 1.77)	0.77	1.08 (0.65, 1.79)
Lower education (ref)	1.00		1.00	1.00		1.00
Employment status						
Currently in paid work	0.96 (0.50 1.86)	0.91	0.96 (0.50, 1.78)	0.53 (0.27, 1.03)	0.06	0.53 (0.26, 1.00)
No paid work (ref)	1.00		1.00	1.00		1.00
Block ii) General health factors. Chiropractor n=155						
	GP (n=92) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Physio (n=89) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Hazardous alcohol intake (AUDIT-C)						
Yes	1.23 (0.70, 2.15)	0.48	1.23 (0.67, 2.15)	1.67 (0.95, 2.92)	0.07	1.67 (0.96, 3.12)
No (ref)	1.00		1.00	1.00		1.00
Smoking						
Yes	1.37 (0.57, 3.26)	0.48	1.37 (0.44, 3.89)	0.63 (0.22, 1.76)	0.37	0.63 (0.16 1.64)
Previously	1.47 (0.82, 2.66)	0.20	1.47 (0.82, 3.16)	1.43 (0.81, 2.54)	0.22	1.43 (0.80, 2.78)

No (ref)	1.00		1.00	1.00		1.00
Health-related quality of life (SF-36, 0-100)						
Physical component	0.96 (0.92, 0.99)	**0.03**	0.96 (0.92, 0.99)	0.97 (0.94, 1.01)	0.96	0.97 (0.94, 1.01)
Mental component	0.95 (0.92. 0.98)	**0.002**	0.95 (0.92. 0.98)	1.00 (0.94, 1.07)	0.99	1.00 (0.97, 1.04)
BMI	0.99 (0.93, 1.06)	0.81	0.99 (0.92, 1.06)	1.00 (0.94, 1.07)	0.99	1.00 (0.92, 1.09)
Comorbidities (SCQ, 0-15)	1.02 (0.81, 1.29)	0.88	1.02 (0.76, 1.31)	1.12 (0.89, 1.41)	0.33	1.12 (0.90, 1.42)
Widespread pain						
Yes	0.16 (0.03, 0.79)	**0.03**	0.16 (0.07, 0.38)	0.50 (0.15, 1.67)	0.26	0.49 (0.10, 1.41)
No (ref)	1.00		1.00	1.00		1.00
Falls self-efficacy (FESI, 16-64)	1.00 (0.93, 1.05)	0.73	0.99 (0.92, 1.07)	0.99 (0.93, 1.06)	0.77	0.99 (0.92, 1.07)
Block iii) Current episode and back pain history. Chiropractor n=134						
	GP (n=80)			Physio (n=92)		
	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Back pain severity (NRS, 0-10)	1.06 (0.91, 1.22)	0.49	1.05 (0.90, 1.22)	0.94 (0.82, 1.08)	0.40	0.94 (0.82, 1.10)
Back-related disability (RMDQ, 0-24)	1.06 (0.99, 1.13)	0.12	1.06 (0.97, 1.14)	1.06 (0.99, 1.13)	0.11	1.06 (0.97, 1.15)
Duration						
Over 3 months	5.49 (2.34, 12.85)	**<0.001**	5.49(1.93, 22.47)	9.00 (4.03, 20.13)	**<0.001**	9.00 (3.53, 32.69)
6 weeks to 3 months	4.92 (1.92, 12.61)	**0.001**	4.92 (1.78, 36.27)	4.90 (1.91, 12.56)	**0.001**	4.90 (1.62, 18.99)
0-6 weeks (ref)	1.00		1.00	1.00		1.00
Morning stiffness						
Significant or extreme	1.02 (0.47, 2.24)	0.96	1.02 (0.54, 2.80)	1.23 (0.57, 2.67)	0.60	1.23 (0.56, 2.75)
Moderate	1.92 (0.88, 4.22)	0.10	1.93 (0.69, 5.55)	2.36 (1.09, 5.14)	**0.03**	2.36 (1.07, 5.75)
A little or none (ref)	1.00		1.00	1.00		1.00
Sleep problems attributable to back pain						
Weekly	0.82 (0.42, 1.62)	0.57	0.82 (0.33, 1.61)	0.77 (0.39, 1.52)	0.45	0.77 (0.38, 1.47)
Less than weekly (ref)	1.00		1.00	1.00		1.00
Previous back pain frequency						
Yearly	1.06 (0.57, 1.96)	0.57	1.06 (0.49, 2.14)	1.07 (0.58, 1.99)	0.82	1.07 (0.51, 2.17)
Not yearly (ref)	1.00		1.00	1.00		1.00
Block iv) Psychological factors. Chiropractor n=155						
	GP (n=96)			Physio (n=94)		
	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Fear-avoidance (FABQ-PA, 0-24)	1.03 (0.98, 1.09)	0.22	1.03 (0.98, 1.10)	1.03 (0.98, 1.08)	0.24	1.03 (0.98, 1.09)
Pain catastrophizing (PCS, 0-52)	1.02 (0.97, 1.06)	0.45	1.02 (0.97, 1.07)	1.05 (1.01, 1.10)	**0.02**	1.05 (1.01, 1.11)
Depression symptoms (CESD, 0-60)	1.00 (0.96, 1.04)	0.97	1.00 (0.95, 1.04)	0.99 (0.95, 1.04)	0.66	0.99 (0.94, 1.04)
Back beliefs (BBQ, 9-45)	0.97 (0.92, 1.02)	0.21	0.97 (0.92, 1.01)	0.99 (0.94, 1.04)	0.64	0.99 (0.94, 1.04)
Expectation for back pain in 3 months						
Recovered	0.24 (0.10, 0.54)	**0.01**	0.24 (0.09, 0.48)	0.43 (0.19, 0.95)	**0.04**	0.43 (0.19, 0.93)
Much better	0.57 (0.29, 1.12)	0.10	0.57 (0.28, 1.10)	0.83 (0.41, 1.68)	0.61	0.83 (0.40, 1.91)
No change or worse(ref)	1.00		1.00	1.00		1.00
Start Back Screening tool						
Medium+high risk	1.31 (0.68, 2.53)	0.42	1.31 (0.62, 2.83)	0.49 (0.24, 1.00)	0.05	0.49 (0.26, 0.86)
Low risk (ref)	1.00		1.00	1.00		1.00
Block v) Clinical variables. Chiropractor n=159						
	GP (n=105)			Physio (n=110)		
	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Number of red flags (0-12)	1.30 (1.02, 1.67)	**0.04**	1.30 (0.97, 1.75)	1.26 (0.99, 1.60)	0.06	1.26 (0.98, 1.59)
Nerve involvement diagnostic tool						
Positive	2.34 (1.27, 4.31)	**0.01**	2.34 (1.23, 4.69)	1.70 (0.93, 3.14)	0.09	1.70 (0.91, 3.33)
Negative (ref)	1.00		1.00	1.00		1.00
Pain on active range of motion						
Yes	0.76 (0.43, 1.32)	0.33	0.76 (0.44, 1.28)	0.92 (0.54, 1.58)	0.77	0.92 (0.53, 1.64)
No (ref)	1.00		1.00	1.00		1.00
Physical performance (BPS, 0-18)	1.19 (1.10, 1.29)	**<0.001**	1.19 (1.11, 1.32)	1.10 (1.02, 1.19)	**0.01**	1.10 (1.02, 1.64)
Timed up and go, mean seconds	0.90 (0.79, 1.03)	0.14	0.90 (0.80, 1.02)	1.00 (0.88, 1.13)	0.94	1.00 (0.87, 1.13)

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire;

FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.
*OR (BCa 95% CI) is average odds ratios from 1000 bootstrapping samples, including bias-corrected accelerated 95% confidence intervals.

Sensitivity analyses S2, physiotherapy patients:

Analyses of differences between physiotherapy patients recruited before 01.01.2018 and after 01.01.2018. After 01.01.2018, there was direct access to physiotherapy in Norway, which potentially could change the population characteristics.

Methods:

- Univariate analyses corresponding to measurement level and distribution: Chi square test or Fischer's exact test for categorical variables, individual sample t-test for normally distributed continuous variables, Mann Whitney U-test for continuous variables with a skewed distribution
- We used the pooled estimates from multiple imputation that were used in the article table 1 and 2

Results:

See Table S2 for details. We found statistically significant differences between PT patients recruited before and after 01.01.2018 on the BBQ and BPS. PT patients recruited before 01.01.2018 held significantly more optimistic beliefs about back pain, with a mean (SD) BBQ score of 30.3 (6.8) for patients recruited before 01.01.2018 compared to 27.3 (7.5) for patients recruited after 01.01.2018 (p=0.03). PT patients recruited before 01.01.2018 had significantly better trunk mobility performance, with a median (IQR) of 5 (2-7) for patients recruited before 01.01.2018 compared to 7 (4-9.75) for patients recruited after 01.01.2018 (p=0.003).

Table S2: Univariate analyses of differences between physiotherapy patients recruited before and after 01.01.2018.

	Physio before (n=90)	Physio after (n=40)	p-value
Age, median (IQR)	68 (62.75, 73)	68.5 (61.5, 76)	0.323
Sex female, n (%)	53 (58.9)	17 (42.5)	0.084
Married or living with partner, n (%)	69 (76.7)	29 (72.5)	0.580
Paid work, n (%)	30 (33.3)	12 (30.0)	0.606
Education level			0.317
- Low (elementary+high school)	51 (56.7)	19 (47.5)	
- High (university> + uni 4+)	39 (43.3)	21 (52.5)	
Health-related quality of life			
- Mental sumscore, median (IQR)	56.29 (51.01, 60.99	54.63 (47.35, 60.37)	0.396
- Physical sumscore, mean (SD)	40.61 (7.91)	40.67 (8.30)	0.969
Hazardous alcohol consumption, n (%)	44 (48.9)	21 (52.5)	0.786
Smoking status			0.202
- Current smoker	9 (10)	4 (10)	
- Previous	46 (51.1)	14 (35)	
- Never	35 (38.9)	22 (55)	
Number of comorbidities, median (IQR)	2 (1, 2.25)	1 (1, 2)	0.235
BMI, median (IQR)	26.60 (24.41, 30.47)	26.37 (24.60, 29.27)	0.913

Fall last 6 weeks, n (%)	18 (20)	7 (17.5)	0.623
Falls self-efficacy, median (IQR)	20 (18, 23.35)	22.5 (17, 26.9)	0.424
Widespread pain, n (%)	5 (5.6)	2 (5.0)	0.880
Previous back pain, n (%)			0.479
- Monthly	35 (38.9)	11 (27.5)	
- Every year	30 (33.3)	14 (35.0)	
- Every 1-5 years	13 (14.4)	5 (12.5)	
- Every five years	8 (8.9)	8 (20.0)	
- Only once	4 (4.4)	2 (5.0)	
Duration of current episode, n (%)			0.538
- 0-6 weeks	30 (33.3)	11 (27.5)	
- 6 weeks to 3 months	17 (18.9)	11 (27.5)	
- 3 months or over	43 (47.8)	19 (47.5)	
Back pain, mean (SD)	5.22 (2.53)	4.69 (1.87)	0.208
Back-related disability, RMDQ, median (IQR)	8 (6, 13)	9.5 (4.25, 14)	0.808
Sleep problems due to back pain, n (%)			0.374
- Weekly	36 (40)	13 (32.5)	
- Less than weekly	54 (60)	27 (67.5)	
Morning stiffness, n (%)			
- Significant or extreme	35 (38.9)	16 (40)	0.753
- Moderate	35 (38.9)	13 (32.5)	
- Some or none	20 (22.2)	11 (27.5)	
Walking distance, n (%)			0.285
- More than 3km	40 (44.4)	16 (40.0)	
- 200m to 3km	41 (45.6)	16 (40.0)	
- Less than 200m	9 (10)	8 (20.0)	
Kinesiophobia (FABQ-PA), median (IQR)	10 (5, 15)	10.5 (5, 14)	0.842
Depression (CES-D), median (IQR)	8 (3.75, 14)	9.5 (5.25, 17.3)	0.305
Pain catastrophizing (PCS), median (IQR)	12 (5.3, 17)	11 (4, 19.6)	0.872
Back beliefs (BBQ), mean (SD)	30.3 (6.8)	27.3 (7.5)	**0.03**
Expectations for back pain next 3 months			0.821
- Fully recovered	17 (18.9)	7 (17.5)	
- Much better	50 (55.5)	21 (52.5)	
- No change or worse	23 (25.5)	12 (30.0)	
SBT risk profiles			0.163
- Low	68 (75.5)	24 (60)	
- Medium	18 (20)	14 (35)	
- High	4 (4.4)	2 (5)	
Physical performance (BPS), median (range)	5 (2, 7)	7 (4, 9.75)	**0.003**
Timed up and go, median (IQR)	7.99 (6.66, 9.18)	7.42 (6.64, 9.86)	0.655
Probable nerve root involvement, n (%)	20 (22.2)	13 (32.5)	0.194
Number of red flags, median (range)	1 (0, 2)	1 (0, 2)	0.815
Pain on active range of motion, n (%)	61 (67.8)	27 (67.5)	0.905

IQR: Interquartile range; SD: Standard deviation; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
AUDIT-C scores of ≥3/12 for women and ≥4/12 indicates hazardous alcohol consumption

Sensitivity analyses S3, only low back pain patients:

Methods:

Multiple multinomial regression. One model per variable block. The chiropractic group is the reference group. For these analyses, 382 patients were available; 106 GP patients, 109 physiotherapy patients, and 167 chiropractic patients.

Results:

See Table S3 for details. Overall, there were very few substantial changes in point estimates and p-values compared to the analyses of all included patients in the article main body. SF-36 physical component summary score was no longer significantly associated with first visiting a GP. Having widespread pain was significantly associated with visiting a physiotherapist compared to a chiropractor. Although point estimates for back-related disability was identical, it was no longer significantly associated with visiting a GP or a physiotherapist. For the Start Back Screening Tool, medium risk category was no longer significantly associated with visiting a chiropractor compared to a physiotherapist, but high risk was significant. Having a positive diagnostic rule for radiculopathy was significantly associated with visiting a physiotherapist compared to a chiropractor.

Table S3: Subgroup analyses of the multinomial regression analyses for patients with low back pain only. Chiropractic group (n=167) is the reference group.

Block i) Sociodemographic factors.				
	GP (n=106) Odds ratio (95% CI)	p-value	Physio (n=109) Odds ratio (95% CI)	p-value
Age	1.03 (0.99, 1.07)	0.23	1.04 (1.00, 1.08)	**0.05**
Gender				
Female	1.43 (0.86, 2.37)	0.17	1.31 (0.78, 2.19)	0.31
Male (ref)	1.00		1.00	
Marital status				
Married/cohabiting	0.58 (0.30, 1.09)	0.09	0.73 (0.38, 1.40)	0.34
Not married/cohabiting (ref)	1.00		1.00	
Educational level				
Higher education	0.97 (0.58, 1.61)	0.91	1.18 (0.71, 1.96)	0.52
Lower education (ref)	1.00		1.00	
Employment status				
Currently in paid work	0.79 (0.40, 1.55)	0.49	0.63 (0.31, 1.28)	0.20
No paid work (ref)	1.00			
Block ii) General health factors.				
Hazardous alcohol intake (AUDIT-C)				
Yes	1.19 (0.69, 2.05)	0.54	1.18 (0.69, 2.01)	0.54
No (ref)	1.00		1.00	
Smoking				
Yes	1.42 (0.64, 3.19)	0.39	0.64 (0.24, 1.71)	0.37
Previously	1.37 (0.75, 2.47)	0.30	1.02 (0.59, 1.77)	0.95
No (ref)	1.00		1.00	
Health-related quality of life (SF-36, 0-100)				
Physical component	0.97 (0.93, 1.00)	0.08	0.98 (0.94, 1.01)	0.20
Mental component	0.97 (0.94, 1.00)	**0.04**	1.00 (0.97, 1.03)	0.96
BMI	0.99 (0.93, 1.05)	0.76	0.96 (0.90, 1.02)	0.23
Comorbidities (SCQ, 0-15)	1.13 (0.90, 1.42)	0.29	1.18 (0.96, 1.47)	0.12
Widespread pain				
Yes	0.16 (0.04, 0.65)	**0.01**	0.30 (0.09, 0.99)	**0.05**
No (ref)	1.00		1.00	
Falls self-efficacy (FESI, 16-64)	1.00 (0.95, 1.05)	0.99	1.01 (0.95, 1.06)	0.85

Block iii) Current episode and back pain history.				
Back pain severity (NRS, 0-10)	0.98 (0.86, 1.11)	0.73	0.89 (0.78, 1.01)	0.07
Back-related disability (RMDQ, 0-24)	1.06 (1.00, 1.13)	0.05	1.06 (1.00, 1.13)	0.06
Duration				
Over 3 months	3.54 (1.42, 8.80)	**<0.01**	3.85 (1.69, 8.77)	**<0.01**
6 weeks to 3 months	3.40 (1.12, 10.37)	**0.03**	3.25 (1.16, 9.09)	**0.03**
0-6 weeks (ref)	1.00		1.00	
Morning stiffness				
Significant or extreme	0.79 (0.39, 1.60)	0.51	1.35 (0.68, 2.67)	0.39
Moderate	1.63 (0.82, 3.24)	0.16	2.02 (1.02, 4.03)	**0.05**
A little or none (ref)	1.00		1.00	
Sleep problems attributable to back pain				
- Weekly	1.13 (0.60, 2.14)	0.70	0.66 (0.34, 1.26)	0.20
- Less than weekly (ref)	1.00		1.00	
Previous back pain frequency				
- Yearly	1.03 (0.57, 1.87)	0.93	1.04 (0.59, 1.83)	0.88
- Not yearly (ref)	1.00		1.00	
Block iv) Psychological factors.				
Fear-avoidance (FABQ-PA, 0-24)	1.00 (0.95, 1.05)	0.97	1.03 (0.98, 1.08)	0.31
Pain catastrophizing (PCS, 0-52)	1.03 (0.99, 1.07)	0.20	1.06 (1.02, 1.10)	**<0.01**
Depression symptoms (CESD, 0-60)	0.97 (0.94, 1.03)	0.50	0.99 (0.95, 1.03)	0.70
Back beliefs (BBQ, 9-45)	0.96 (0.92, 1.01)	0.12	0.99 (0.94, 1.04)	0.63
Expectation for back pain in 3 months				
Recovered	0.21 (0.09, 0.49)	**<0.01**	0.34 (0.16, 0.73)	**<0.01**
Much better	0.60 (0.31, 1.16)	0.13	0.71 (0.36, 1.39)	0.31
No change or worse(ref)	1.00		1.00	
Start Back Screening tool				
High risk	1.82 (0.55, 6.05)	0.33	0.19 (0.04, 0.90)	**0.04**
Medium risk	1.03 (0.52, 2.06)	0.92	0.59 (0.30, 1.17)	0.13
Low risk (ref)	1.00		1.00	
Block v) Clinical variables.				
Number of red flags (0-12)	1.28 (0.98, 1.68)	0.07	1.16 (0.90, 1.50)	0.24
Diagnostic rule for radiculopathy				
Positive	2.32 (1.24, 4.34)	**<0.01**	1.89 (1.00, 3.57)	**0.05**
Negative (ref)	1.00		1.00	
Pain on active range of motion				
Yes	0.88 (0.50, 1.53)	0.64	1.06 (0.62, 1.80)	0.84
No (ref)	1.00			
Physical performance (BPS, 0-18)	1.19 (1.10, 1.28)	**0.03**	1.09 (1.01, 1.17)	**0.03**
Timed up and go, mean seconds	0.89 (0.78, 1.01)	0.06	0.97 (0.86, 1.09)	0.56

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.

Assessment of generalizability S4:

Table S4: Descriptive comparison of NORLAG sample and NORLAG 2017 musculoskeletal (MSK) subsample with BACE-N sample.

	NORLAG 2017 subsample MSK conditions^ (n=794)	**BACE-N (n=452)**
Age, median (IQR, range)	66 (60-74, 50-93)	66 (59-72, 55-89)
Gender female, n (%)	506 (63.7)	235 (52)
Mother tongue Norwegian (n=432), n (valid %)		412 (95.4)
Country of origin Norway, n (%)	728 (91.7)	
Educational level, n (%)		
- Low (elementary + high school)	566 (71.4)	253 (56.0)
- High (university level)	227 (28.6)	199 (44.0)
In paid work, n (%)	251 (31.6)	205 (45.3)
Living with partner, n (%)	494 (62.2)	347 (76.8)
BMI, mean (SD)	26.3 (4.4)	27.6 (4.7)
How many alcoholic units do you normally drink?~ n (valid %)		
- 1-2		
- 3-4		
- 5-6	183 (70.1)	289 (63.9)
- 7-9	62 (23.8)	136 (30.1)
- 10 or more	10 (3.8)	22 (4.8)
	1 (0.4)	2 (0.4)
	5 (1.9)	3 (0.7)
How often have you drunk alcohol until you felt intoxicated? (n=433) n, (valid %)		
- Once per week	12 (2.8)	
- 2-3 times per week	3 (0.7)	
- 2-3 times per month	18 (4.2)	
- Once per month	37 (8.5)	
- Rarely	235 (54.3)	
- Never	128 (29.6)	
How often do you drink 6 alcoholic units or more?		
- Almost daily		1 (0.2)
- Some days per week		3 (0.7)
- Some days per month		41 (9.1)
- Rarely		194 (42.9)
- Never		213 (47.1)
CES-D (IQR, range)	8 (4-14, 0-38)	8 (4-15, 0-46)
HR-QoL, physical summary score*, mean (SD)	37.5 (11.3)	41.4 (8.4)
HR-QoL, mental summary score*, mean (SD)	54.7 (8.2)	52.5 (10.0)
Walking distance		
- Cannot walk	13 (1.7)	
- A few steps	22 (2.8)	
- 10-100 m	59 (7.6)	
- 100-500m	57 (7.3)	
- 500m-1km	82 (10.5)	
- 1-5km	235 (30.1)	
- 5km+	313 (40.1)	
Walking distance		
- Less than 15m		20 (0.7)
- 15m-200m		310 (11.5)
- 200m-3km		1130 (42.1)
- 3km+		1218 (45.3)

IQR: Interquartile range; SD; Standard deviation; BMI: Body mass index; CES-D: Center for Epidemiological Studies – Depression questionnaire; HR-QoL: Health-related quality of life

^The subsample was collected in 2017 and consisted of participants aged 55 years or older, with at least one musculoskeletal condition

~ In NORLAG, this variable is continuously, as "number of alcoholic drunks usually drunk per time you drink alcohol". In BACE-N, it is the AUDIT-C question 2, a categorical question with 5 categories: 1-2, 3-4, 5-6, 7-9 and 10 or more.

*NORLAG used Short Form Health Survey-12, BACE-N used Short Form Health Survey-36

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*5-7*
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	8
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9, 19-20
		(b) Indicate number of participants with missing data for each variable of interest	9, 19-20
Outcome data	15*	Report numbers of outcome events or summary measures	9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-10, 20-21

		(*b*) Report category boundaries when continuous variables were categorized	6-7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10, suppl.
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Characteristics of older adults with back pain associated with choice of first primary care provider: a cross-sectional analysis from the BACE-N cohort study

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Article title:

Characteristics of older adults with back pain associated with choice of first primary care provider: a cross-sectional analysis from the BACE-N cohort study

Authors:
Ørjan Nesse Vigdal[1]

Kjersti Storheim[2,1]

Rikke Munk Killingmo[1]

Milada C. Småstuen[1]

Margreth Grotle[1,2]

Author affiliations:

[1]Department of Physiotherapy, Faculty of Health Science, OsloMet - Oslo Metropolitan University, Oslo, Norway

[2]Research and Communication Unit for Musculoskeletal Health (FORMI), Division of Clinical Neuroscience, Oslo University Hospital, Oslo, Norway

Corresponding author:
Ørjan Nesse Vigdal

E-mail address: orvig@oslomet.no
Mailing address: OsloMet – Oslo Metropolitan University, Post box 4, St.Olavs plass, 0130 Oslo, Norway
Telephone number: +47 414 59 314

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Abstract

Objectives: To describe characteristics of older adults with back pain in primary care, and to assess associations between patient characteristics and type of first primary care provider (general practitioner (GP), physiotherapist (PT) or chiropractor).

Design: Cross-sectional analysis from the BACE-N cohort study.

Setting: Norwegian GP, PT and chiropractic primary care centres.

Participants: Patients aged ≥55 years seeking Norwegian primary care with a new episode of back pain were invited to participate. Between April 2015 and February 2020, we included 452 patients: 127 first visited a GP, 130 first visited a PT and 195 first visited a chiropractor.

Primary and secondary outcome measures: For the first objective, the outcome measure was descriptive statistics of patient characteristics, covering the following domains: sociodemographic, general health, current and previous back pain, psychological and clinical factors. For the second objective, first primary care provider was the outcome measure. Associations between patient characteristics and visiting a GP or PT compared to a chiropractor were assessed with multiple multinomial regression analyses.

Results: Median (IQR) age was 66 (59-72) years. Levels of back-related disability was moderate to severe, with a median (IQR) Roland-Morris Disability Questionnaire (range 0-24) score of 9 (5-13). Recurring episodes were common, 301 (67%) patients had monthly or yearly recurrences. Patients with worse back-related disability, longer duration of symptoms, lower expectations for full recovery and worse physical performance measured with the Back Performance Scale had higher odds of visiting a GP or PT compared to a chiropractor ($p<0.05$).

Conclusion: Older back pain patients in primary care had moderate to severe levels of back-related disability, and most had recurring episodes. Our results suggest that older adult's choice of first primary care provider was associated with important patient characteristics, which highlights the need for caution with generalizations of study results across primary care populations.

Trial registration number: ClinicalTrials identifier: NCT04261309

Data availability statement

Data not available.

Keywords: Back pain, older adults, primary care, characteristics, care-seeking behaviour

Article summary

Strengths and limitations of this study

- We used descriptive statistics to provide a thorough presentation of characteristics of older people seeking primary care for a new episode of back pain.
- This study utilized multivariate, multinomial regression analyses to provide a comprehensive overview of associations between patient characteristics and choice of first healthcare provider.
- It was not possible to obtain data on eligible patients that were not invited or declined to participate in the study, which might reduce external validity.
- Due to differences in primary care organization between countries, readers are advised to exercise caution with generalizations of results to other healthcare systems.

Introduction

Back pain is the number one cause of years lived with disability globally, with an estimated point prevalence of 11.9% [1, 2]. Older adults have historically been under-represented in back pain research [3, 4], but have recently received increased attention [5, 6]. Although the prevalence of pathoanatomical findings on diagnostic imaging increases with age [7-9], the prevalence of serious pathology, such as vertebral fractures and neuropathic pain in older back pain patients in primary care is low. Studies have reported a prevalence of 6% and 2-11%, respectively [10, 11]. Moreover, studies in primary care have found significant national differences in the characteristics and burden of back pain in older adults [12, 13]. This highlights the importance of caution when generalizing results from studies from one setting to another.

Most patients seeking healthcare for back pain are treated in primary care [14]. In Norway, back pain is the reason for 10%, 27% and 86% of the visits to general practitioners (GP), physiotherapists (PT) and chiropractors, respectively [15]. Some studies suggest that choice of first primary care provider has consequences for future healthcare consumption, including imaging and opioid use [16, 17]. To optimize decision making regarding treatment, research and health policies, detailed knowledge of patient populations is required. Most of the previous studies exploring patient populations seeking primary care have compared GP and chiropractic populations, showing that patients seeking care from a GP have a higher overall burden of back pain compared to chiropractic patients [18-25]. Only a few studies include PT populations [26-29]. These studies suggest that patients seeking care from PTs are older and have more disability than those seeking care from chiropractors [26, 27, 29]. To the best of our knowledge, only one study has been performed in an exclusively older population [28]. This study found that older women seeking care from GPs reported worse back pain and worse health-related quality of life than older women visiting a PT or a chiropractor [28]. The study only included women between 59-64 years of age, and it is not clear if the results are also generalizable to men or adults over 65 years of age. Further, they did not examine back-related disability or other back pain factors, sociodemographic factors, psychological factors or clinical factors. Thus, there is still a considerable lack of knowledge regarding whether characteristics of older back pain patients differ according to their choice of first primary care provider.

Therefore, the aims of this study were 1) to describe the characteristics of patients ≥55 years of age seeking primary care for a new episode of back pain in terms of sociodemographic, general health, current back pain and back pain history, psychological and clinical characteristics, and 2) to assess if patient characteristics are associated with type of first primary care provider (GP, PT or chiropractor).

Methods

Design and setting

This cross-sectional study presents baseline data from the Back Complaints in the Elders – Norway (BACE-N) study, a prospective observational cohort study in Norwegian primary care. The BACE-N study is a part of the international BACE consortium, with research groups from Brazil, the Netherlands and Australia [6]. The BACE-N study protocol has been registered in ClinicalTrials.gov (Identifier NCT04261309). The study was classified as a quality assessment study by the Norwegian Regional Committee for Medical Research Ethics (reference no. 2014/1634/REK vest) and was approved by the Norwegian Social Science Data Service in 2015 (reference no. 42149).

Norwegian primary care is organized by the municipalities and financed through the National Insurance Scheme, the municipalities, and patient co-payment [30]. There is direct access to GPs, PTs (from 2018) and chiropractors [30]. Patient co-payment rates vary between healthcare providers, with chiropractors generally having the highest co-payment cost [30]. Treatments provided usually differ between the healthcare providers. For example, patients visiting a GP are more likely to receive pharmacological therapy, patients visiting a PT are more likely to receive exercise therapy, and patients visiting chiropractors are more likely to receive manipulation therapy [15].

Participants and recruitment procedure

Eligible patients were ≥55 years of age, seeking primary care from a GP, PT or chiropractor in primary care for a new episode of back pain. Back pain was defined as pain located in the region from the top of the scapula to the sacrum, with or without radiating leg pain. A new episode was defined as not having received healthcare for the same complaint in the last six months. Patients were excluded if they had difficulties completing the questionnaire due to language barriers, or if they had difficulties completing the clinical examination (for example wheelchair-bound patients). Participants received care as usual.

Patients were recruited from GPs, PTs, and chiropractors in urban and rural parts of Norway between April 2015 and February 2020, either during or immediately after the consultation. The primary care providers were instructed to invite consecutive patients. To facilitate the recruitment process, media advertisements were also used. Eligible patients received oral and written information about the study. The final screening for eligibility and inclusion to the study was performed by the researchers. All included patients signed an informed consent form before enrolment in the study. The baseline

measurements, consisting of questionnaires and a clinical examination, were collected as soon after the first primary care consultation as possible.

Measurements

Sociodemographic variables

Information regarding age, sex, marital status, employment status and educational level were collected.

General health variables

Health-related quality of life (HR-QoL) was measured using the Short-Form Health Survey 36-item (SF-36) physical and mental summary measures (standardized with a mean of 50 and a standard deviation of 10 according to a general US population with higher scores denoting better health) [31]. Alcohol consumption was measured using the 3-item Alcohol Use Disorder Identification Test consumption questions (AUDIT-C) (range 0-12, higher score indicates higher alcohol consumption) [32]. Hazardous alcohol consumption was defined as an AUDIT-C score of ≥3/12 for women and ≥4/12 for men [33, 34]. Smoking status (current smoker, previous smoker, non-smoker) was collected. The number of comorbidities was measured using the Self-Administered Comorbidity Questionnaire (SCQ) [35]. The SCQ has 13 pre-defined comorbidities and two optional comorbidities. Item 12, "back pain", was replaced with a third optional comorbidity. Widespread pain was measured using the pain drawing from McGill Pain Questionnaire and the revised criteria from Wolfe et al. for widespread pain [36, 37]. The number of falls during the last six weeks was collected, and falls self-efficacy was measured using the Falls Efficacy Scale-International (FES-I) (range 16-64, higher score indicated lower falls efficacy) [38].

Current back pain and back pain history

Back pain location (thoracic or lumbar, or both) was collected. Average back pain severity last week was measured using the Numeric Rating Scale (NRS) (range 0-10, higher score indicates higher back pain severity) [39]. Back-related disability was measured with the 24-item Roland-Morris Disability Questionnaire (RMDQ) (range 0-24, higher score indicated more back-related disability) [40]. Back pain duration was measured in days and categorized into "<6 weeks", "6 weeks to 3 months", and ">3 months". Frequency of previous back pain episodes (monthly, yearly, every 1-5 years, every five years, once) was collected. Sleep problems attributable to back pain were measured using item 5i from the Pittsburgh Sleep Quality Index (PSQI) [41], and dichotomized to "weekly/less than weekly". Morning stiffness was measured with item six from Knee injury and Osteoarthritis Outcome Score (KOOS) [42], where we replaced the word "knee" with "back".

Psychological variables

Kinesiophobia was measured using the Fear-Avoidance Beliefs Questionnaire-Physical Activity subscale (FABQ-PA) (range 0-24, higher score indicates higher levels of kinesiophobia) [43]. Signs of depression were measured with the Center for Epidemiological Studies-Depression questionnaire (CES-D) (range 0-60, higher score indicates more signs of depression) [44]. Pain catastrophizing was measured using the Pain Catastrophizing Scale (PCS) (range 0-52, higher score indicates more pain catastrophizing) [45]. Beliefs and attitudes towards back pain was measured using the Back Beliefs Questionnaire (BBQ) (range 9-45, higher score indicates more positive beliefs) [46]. Start Back Screening Tool (SBT) was used to assess prognostic risk profiles [47]. Expectations of recovery from back pain within the next 3 months was assessed with a five-point scale, with the categories "Fully recovered", "Much better", "No difference", "Much worse", and "Worse than ever".

Clinical variables

Pain with active movements was assessed for forward flexion, lateral flexion and rotation of the back. Physical performance with focus on trunk mobility was assessed with the 6-item Back Performance Scale (BPS) (range 0-18, higher score indicates worse trunk mobility performance) [48]. Walking function was assessed with the Timed-Up-and-Go (TUG) [49]. Signs of radiculopathy was measured using a clinical diagnostic model that summarizes five items: Subjective sensory changes (1 point), radiating pain below the knee (2 points), leg pain worse than back pain (2 points), positive neural tension test (3 points) and neurological deficit of myotome, dermatome or reflexes in the lower limb (2 points) [50]. A score of ≥5/10 has been shown to indicate >80% probability of radiculopathy [50]. Twelve red flags were assessed: Cancer, first episode of back pain, constant pain, unexplained weight loss, systemically unwell, fever, urinary retention or loss of bladder control, age ≥75 years, trauma cause of back pain, osteoporosis, cortisone use and severe morning stiffness.

Statistical analyses

All analyses were performed using the IBM SPSS Statistics version 26 for Windows (IBM Corporation, Armonk, NY, USA). To handle missing data, five multiple imputation datasets with 10 iterations were created using regression estimation, and the pooled estimates are presented in this study. Patient characteristics were described with counts and percentages for categorical variables, mean and standard deviation (SD) for normally distributed continuous variables and median and interquartile range (IQR) for continuous variables with a skewed distribution. Mann-Whitney U-test was used to assess differences in days between first primary care contact and inclusion to the study between primary care practitioners, and between those recruited from primary care and those recruited from

media advertisements. Multinomial regression was used to assess the strength of the associations between patient characteristics and patient's choice of first primary care provider. First primary care provider (GP, PT or chiropractor) was the dependent variable. The chiropractic group was the largest, and therefore chosen as the reference group. Patient characteristics were organized into five blocks, for which we created separate models: i) Sociodemographic ii) general health iii) current back pain episode and back pain history iv) psychological variables and v) clinical variables. All variables in the block were simultaneously included in the model, without univariate pre-testing. The strength of associations is expressed as odds ratios (OR) with 95% confidence intervals (CI). We considered our study as exploratory, so no correction for multiple testing was performed [51]. P-values <0.05 were thus considered statistically significant. All tests were two-sided.

Assessment of generalizability

Because of economic and practical reasons, we were unable to collect data on eligible participants that declined to participate or for other reasons were not invited. Therefore, we performed a descriptive comparison of the BACE-N on age, sex, nationality, educational level, work status, marital status, BMI, alcohol use, HR-QoL, depression and walking distance with individual data from a subsample from the study "The Norwegian study on life course, ageing and generation (NORLAG)" [52, 53]. This study used a random sampling strategy in the general population and included 11028 participants. The subsample (NORLAG MSK) consisted of 794 participants collected in 2017. The participants of the subsample were ≥55 years of age and had at least one musculoskeletal complaint.

Sensitivity analyses

We performed three sensitivity analyses: 1) To assess possible bias introduced by the multiple imputation procedure, the multiple multinomial regression analyses were performed on complete case data. We included a bootstrapping approach to assess the robustness of the coefficients. 2) Because PT services became available through direct access in Norway from 01.01.2018, characteristics of PT patients recruited before and after 01.01.2018 were compared using individual sample t-tests or Mann-Whitney U-tests for continuous variables, and chi-square tests for categorical variables. 3) We performed the multiple multinomial regression analyses in the subgroup with low back pain only. Results from the sensitivity analyses are available in supplementary material S1 through S3.

Sample size consideration

Sample size was considered for the BACE-N study as a whole, with the following criteria: Having sufficient statistical power for up to 14 variables in a multivariate logistic regression analysis using

the "10 events per variable" rule [54], with an outcome prevalence of 40%, and allowing for a dropout-rate of 20%. This yielded a preferred sample size of 450 participants. As the multinomial regression models in this study includes a maximum of 8 independent variables, we expect the sample size to be sufficient.

Patient and public involvement

Patient representatives were part of the scientific board of the study and involved in designing and establishing BACE-N. Results will be disseminated to the recruiting primary care providers and the participating patients in an annual newsletter.

Results

A total of 452 patients were included in the study, 127 first visited a GP, 130 first visited a PT and 195 first visited a chiropractor. Eighteen patients were included from media advertisements. Median (IQR) number of days from first primary care contact to inclusion in the study was 13 (3-21) days for GP patients, 9 (3-21) for physiotherapy patients and 5 (1-13) for chiropractic patients. The duration was significantly shorter for chiropractic patients compared to GP patients ($p<0.01$) and PT patients ($p<0.01$). There was no statistically significant difference in duration from first primary care contact to inclusion between those recruited directly from primary care practices (median (IQR) 7 (2-15) days), and those recruited through media advertisements (median (IQR) 16 (1-28) days) ($p=0.315$).

Patient characteristics

Missingness ranged from 0.0 to 16.8% for the variables, and total missingness was 4.4% across all values. Rates of missingness was similarly distributed across the primary care provider groups. Consult table 1 for details regarding patient characteristics. The median age of the patients was 66, around half of the patients were women, were in paid work, and had university-level education. Half of the patients had a hazardous alcohol consumption level, and nearly 60% of them were either current or previous smokers. One in six patients had experienced a fall during the last six weeks. Half of the patients had one or more comorbidities.

Most patients reported moderate levels of back pain and moderate to severe levels of back-related disability with a median (IQR) RMDQ-score of 9 (5-13). Almost 70% of the patients experienced monthly or yearly recurrences of back pain. Over 40% experienced weekly sleep problems attributable to back pain, and 70% experienced moderate to extreme morning stiffness. Two thirds of the patients had a low-risk profile according to the SBT, and only 6.6% had a high-risk profile.

Expectations of recovery were generally high, with three out of four expecting to be much better or fully recovered within three months.

Associations between patient characteristics and type of first primary care provider

Table 2 presents the associations from the multinomial regression analyses. Patients with higher back-related disability, longer duration of symptoms, worse physical performance, probable radiculopathy, poorer HR-QoL and lower expectations of being fully recovered within the next three months were more likely to visit a GP compared to a chiropractor. Patients with widespread pain were more likely to visit a chiropractor than a GP. The characteristics strongest associated with choosing a GP versus a chiropractor were duration of symptoms, widespread pain and expectation of being fully recovered.

Patients that were older, had a longer duration of symptoms, higher back-related disability, moderate morning stiffness, higher levels of pain catastrophizing, worse physical performance, lower expectations of being fully recovered within the next three months were more likely to visit a PT compared to a chiropractor. Patients in the SBT medium or high risk group were more likely to visit a chiropractor compared to a PT. The characteristics strongest associated with choosing a PT versus a chiropractor were duration of symptoms and expectation of being fully recovered.

Gender, education level, marital status, employment status, comorbidities, back pain severity, sleep problems, kinesiophobia, depressive signs, back beliefs, red flags, pain on active range of motion and Timed Up and Go-scores were not associated with type of primary care provider.

Assessment of generalizability

The BACE-N study sample had more men (48% versus 36.3% in NORLAG MSK), more participants with high educational level (44% versus 28.6% in NORLAG MSK), more participants currently in paid work (45.3% versus 31.6% in NORLAG MSK), and more participants living with a partner (76.8% versus 62.2% in NORLAG MSK). Age, nationality, alcohol consumption, BMI, depressive signs, HR-QoL and walking distance were similar for BACE-N and NORLAG MSK. See supplementary material S4 for further details.

Discussion

This study showed that nearly all older patients with back pain had experienced back pain previously, and for most patients this episode was the latest of a series of annually or monthly recurring

episodes. This is in accordance with several studies on back pain trajectories, where episodic or fluctuating pain was shown to be common both in the short and long term [55-58]. Further, patients with more severe back-related disability and other symptoms and signs were overall more likely to visit a GP or a physiotherapist than a chiropractor. Contrary to this finding, patients with widespread pain were more likely to choose a chiropractor over a GP. This is the first study to assess associations of a broad range of patient characteristics and choice of first primary care provider in an older population. Older adults have previously been under-represented in back pain studies [3, 4], and the evidence underlying treatment decisions in this age group may have been over-reliant on studies performed in younger populations. Thus, this study provides evidence to improve knowledge about older adults with back pain. This may prove important for clinical guideline development and informing stakeholders aiming to improve quality of care for older adults with back pain.

The burden of back pain and psychological profile were comparable between younger Norwegian back pain cohorts and the older BACE-N sample [59, 60]. The characteristics of the included patients in this study was largely comparable to the BACE-study from the Netherlands [12, 61], with a few exceptions. Both in our total study sample and our GP subsample, a larger proportion of patients had paid work, fewer experienced their first episode of back pain, and they reported lower levels of kinesiophobia and pain catastrophizing compared to the Dutch study sample. When comparing our results to the Brazilian BACE-study [12, 62], the Brazilian study had a higher proportion of women. Further, our study sample had more patients in paid work, more patients with hazardous alcohol consumption patterns, more smokers, the patients had fewer comorbidities, lower levels of back-related disability and back pain severity, kinesiophobia, depression signs, and pain catastrophizing compared to the Brazilian BACE-sample. These differences between populations within the BACE consortium might be explained in part by minor differences in recruitment strategies in the different countries [12] or differences in how primary care is organized in the different countries. In the Netherlands, patients were recruited exclusively from a GP setting [61], whereas in Brazil patients were recruited from primary care centres or health centres specialized in geriatrics [62]. Another possible explanation may be cultural differences in the expression and interpretation of and coping with pain [63].

In line with previous research on healthcare utilization for back pain in younger populations [19, 21-23, 25-28], our results suggest that patients with “less complex” characteristics were more likely to visit a chiropractor compared to a GP or a physiotherapist. Unsurprisingly, studies using bivariate analyses [18, 20, 23, 25, 28, 29] to compare the provider groups find more significant associations or differences than studies using multivariate analyses [19, 21, 22, 26, 27]. However, regardless of

statistical approach, these studies suggest that patients who seek chiropractic care have an overall lower burden of back pain compared to patients seeking GP or PT care [18-23, 25]. One notable exception is the study of Eklund et al. [24], which found that Swedish chiropractic patients had more pain and worse psychological and behavioural characteristics compared to a sample of sick-listed primary care (specific provider unknown) patients at high risk for chronicity. Our finding showing that patients with widespread pain were more likely to choose a chiropractor over a GP was contrary to the general pattern of chiropractic patients being less "complex." To the best of our knowledge, no previous studies have compared prevalence of widespread pain in the two populations, but one study showed that GP patients had more musculoskeletal comorbidities [25], possibly implying more widespread pain. Two previous studies found an association between higher age and odds of seeking care from a physiotherapist compared to a chiropractor [26, 27], in line with our results.

Many of the patient characteristics associated with choice of primary care provider in this study have previously been found to be significant prognostic factors for the persistent back-related disability and back pain in older people. For example, duration of back pain and expectation of improvement [64-69], and higher levels of back-related disability [65-70], are consistently reported as significant prognostic factors for a poor outcome of a back pain episode. A few studies in older people have found that single symptoms of neurological involvement such as leg pain below the knee, and the diagnosis of spinal stenosis were prognostic factors for the outcome of a back pain episode [64, 67]. We combined single symptoms of neurological involvement into a compound measure, but it is likely that older patients with radiculopathy have worse outcomes than those without radiculopathy. Although slightly different from widespread pain, the presence of multi-site pain has also in some studies been found to be a prognostic factor for the outcome of back pain in older adults [67, 71]. The impact of pain catastrophizing on the clinical course of back pain is less clear in older adults [66, 69] compared to younger populations [72], but it is not unreasonable to believe that pain catastrophizing may be a prognostic factor for back pain in older adults. Thus, the associations between potential prognostic factors and choice of first primary care provider imply that we can expect the clinical course of patients in the three primary care groups to be different. Further, they imply that caution should be exercised when generalizing across primary care populations.

The results of this study need to be viewed with consideration of some limitations. We instructed the recruiting primary care providers to invite consecutive patients, but because of obvious time constraints in clinical practice we could not ask them to keep record of how many declined to participate, nor of eligible patients that were not invited. This recruitment strategy increases the risk of selection bias, and thus could reduce the external validity of the study. To compensate for this

limitation, we compared the BACE-N sample with the NORLAG MSK subsample. The characteristics of the two samples were largely comparable, but BACE-N has more men, more participants with higher education, more in paid work, and more living with their partner. Sex and education level have previously been shown to be associated with back pain severity and back-related disability in older adults [12, 13]. Thus, it may be possible that the levels of back pain and back-related disability presented in this study are slightly underestimated. The NORLAG MSK subsample is sampled from the general population, which may not be representative of those who seek care. However, the most important determinants of care-seeking for back pain seems to be pain severity and disability levels [73]. We therefore believe the assessment to be justified.

Another limitation may be the analysis strategy. We chose to keep the variables in the five blocks to provide a broad assessment of the differences in case-mix in the three primary care settings. To limit the number of statistical tests performed, univariate pre-testing and testing a "final model" across blocks were avoided. Furthermore, a different organization of the variables, for example strictly adhering to the biopsychosocial model [74] or Andersen's behavioural model of health services use [75], may have yielded slightly different results. However, our results are largely supported by previous studies, so the potential differences because of analysis strategy or variable organization may be negligible. A third limitation is that we were unable to examine some possibly important determinants for healthcare use, such as access to different providers, patient's familiarity with providers, the patient's economic situation and social network referrals [75-77]. These factors may be the most important determinants in driving the patient's choice of first primary care provider, and including these factors would have given an even broader overview of associations between individual and contextual characteristics and choice of primary care provider. We suggest that future research focus on examining the contextual and social factors associated with healthcare service use. Finally, generalization of our results to other healthcare systems may be limited. Different healthcare systems may have different access to care, different payment schemes and different professional training and responsibilities for the healthcare providers, all of which may impact health services utilization and consequently the patient characteristics associated with choosing different primary care provides [75, 78, 79].

Conclusion

We found that nearly all older adults with back pain seeking primary care had experienced back pain previously, and recurring episodes were common. In general, patients with more severe back-related disability and other clinical symptoms and signs were more likely to visit a GP or a physiotherapist than a chiropractor. Our results suggest that important patient characteristics are associated with

older adult's choice of primary care providers due to back pain, which may affect the clinical course of back pain for these patients. The findings highlight the need for caution with generalization of study results across primary care populations. This is an important consideration for healthcare providers, for the development and implementation of clinical practice guidelines, and for regulators when developing primary care pathways for back pain. Further research is needed in assessing if the choice of primary care provider affects future care pathways and the clinical course of back pain in older adults.

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Author contributions:

ØNV: Study design, data collection, data analyses, manuscript draft. KS: Study design, data interpretation, critical revision. RMK: Data collection, data interpretation, critical revision. MCS: Statistical advisor, data interpretation, critical revision. MG: Principal investigator, study design, data interpretation, critical revision.

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Competing interests

The authors declare no competing interests.

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Table 1: Baseline characteristics of study participants*

	Missing, n (%)	Total (n=452)	GP (n=127)	PT (n=130)	Chiro (n=195)
Sociodemographic variables					
Age, median (IQR)	0 (0.0)	66 (59-72)	67 (60-73)	68 (63-74)	63 (58-71)
Female, n (%)	0 (0.0)	235 (52.0)	74 (58.3)	70 (53.8)	89 (46.1)
Marital status	19 (4.2)				
Married or living with partner, n (%)		347 (76.8)	90 (70.1)	98 (74.6)	158 (81.0)
Employment status	5 (1.1)				
Currently in paid work, n (%)		212 (45.3)	57 (43.3)	49 (31.5)	106 (55.9)
Educational level, n (%)	20 (4.4)				
Low (elementary + high school)		253 (56.0)	72 (56.7)	70 (55.1)	110 (56.4)
High (university level)		199 (44.0)	55 (43.3)	60 (44.9)	85 (43.6)
General health variables					
Health-related quality of life (SF-36 0-100)	41 (9.1)				
Mental sumscore, mean (SD)		52.5 (10.0)	50.5 (11.5)	53.4 (10.0)	53.2 (8.8)
Physical sumscore, mean (SD)		41.4 (8.4)	40.0 (7.9)	40.6 (8.0)	42.8 (8.9)
Hazardous alcohol consumption (AUDIT-C^), n (%)	59 (13.1)	228 (50.4)	65 (51.1)	65 (50.0)	98 (50.2)
Smoking status, n (%)	22 (4.9)				
Current smoker		63 (13.9)	21 (16.5)	13 (10.0)	28 (14.3)
Previous		203 (44.9)	59 (46.4)	60 (46.2)	84 (43.1)
Never		186 (41.2)	47 (37.0)	57 (43.8)	83 (42.6)
Number of comorbidities (SCQ 0-15), median (IQR)	18 (4.0)	1 (1-2)	1 (0-2)	2 (1-2)	1 (1-5)
BMI, mean (SD)	14 (3.1)	27.6 (4.7)	27.6 (4.5)	27.5 (4.7)	27.7 (4.8)
Fall last 6 weeks, n (%)	24 (5.3)	73 (16.1)	13 (10.2)	24 (18.4)	35 (18.2)
Falls self-efficacy (FESI 16-64), mean (SD)	48 (10.6)	21.8 (6.0)	22.4 (6.3)	22.2 (6.1)	21.1 (5.7)
Widespread pain, n (%)	16 (3.5)	33 (7.3)	5 (4.0)	7 (5.3)	21 (10.8)
Current back pain and back pain history variables					
Previous back pain, n (%)	58 (12.8)				
Monthly		127 (28.1)	42 (33.1)	46 (35.4)	40 (20.5)
Every year		174 (38.5)	45 (35.4)	44 (33.8)	86 (44.1)
Every 1-5 years		90 (19.9)	26 (20.5)	19 (14.6)	45 (23.1)
Every five years		45 (10.0)	10 (7.9)	16 (12.3)	20 (10.3)
Only once		15 (3.3)	4 (3.1)	6 (4.6)	4 (2.1)
Back pain location of current episode, n (%)	11 (2.4)				
Thoracic only		19 (4.2)	4 (3.1)	7 (5.4)	8 (4.1)
Lumbar only		382 (84.5)	106 (83.5)	109 (83.8)	167 (85.6)
Both		51 (11.3)	17 (13.4)	14 (10.8)	20 (10.3)
Duration of current episode, n (%)	76 (16.8)				
0-6 weeks		297 (65.7)	74 (58.3)	67 (51.5)	156 (80.0)
6 weeks to 3 months		59 (13.1)	22 (17.3)	21 (16.2)	16 (8.2)
3 months or over		96 (21.2)	31 (24.4)	42 (32.3)	23 (11.8)
Back pain severity (NRS 0-10), mean (SD)	31 (6.9)	5.4 (2.3)	5.7 (2.2)	5.1 (2.3)	5.4 (2.4)
Back-related disability (RMDQ 0-24), median (IQR)	45 (10.0)	9 (5-13)	10 (6-14)	9 (6-13)	8 (3-13)
Sleep problems due to back pain, n (%)	24 (5.3)				
Weekly		189 (41.8)	60 (47.2)	49 (37.7)	80 (41.0)
Less than weekly		263 (58.2)	67 (52.8)	81 (62.3)	115 (59.0)
Morning stiffness, n (%)	26 (5.8)				
Significant or extreme		178 (39.3)	47 (37.0)	51 (39.2)	81 (41.5)
Moderate		144 (31.9)	44 (34.6)	48 (36.9)	51 (26.2)
Some or none		130 (28.8)	36 (28.3)	31 (23.9)	63 (32.3)
Psychological variables					
Kinesiophobia (FABQ-PA 0-24), median (IQR)	18 (4.0)	10 (5-14)	11 (6-14)	10 (5-15)	9 (3-13)
Depression (CES-D 0-60), median (IQR)	57 (12.6)	8 (4-15)	10 (4-17)	8.5 (4-15)	7 (4-13)
Pain catastrophizing (PCS 0-52), median (IQR)	35 (7.7)	10 (4-16)	11 (5-18)	12 (5-18)	7 (3-14)
Back beliefs (BBQ 9-45), mean (SD)	57 (12.6)	29.8 (7.0)	28.0 (6.9)	29.3 (7.2)	31.3 (6.7)
Expectations for back pain next 3 months, n (%)	19 (4.2)				
Fully recovered		115 (25.4)	19 (15.0)	24 (18.5)	72 (36.9)

Much better		226 (50.0)	66 (52.0)	71 (54.6)	89 (45.6)
No change or worse		111 (24.6)	42 (33.0)	35 (26.9)	33 (16.9)
Start Back Screening Tool risk profiles, n (%)	31 (6.9)				
Low		297 (65.7)	72 (56.7)	92 (70.8)	133 (68.2)
Medium		125 (27.7)	38 (29.9)	32 (24.6)	55 (28.2)
High		30 (6.6)	16 (12.6)	6 (4.6)	8 (4.1)
Clinical variables					
Physical performance (BPS 0-18), median (IQR)	20 (4.4)	5 (2-8)	7 (3-9)	5 (3-8)	4 (1-7)
Timed up and go, mean seconds (SD)	7 (1.5)	8.0 (2.5)	8.2 (3.0)	8.3 (2.3)	7.8 (2.2)
Positive diagnostic rule for radiculopathy, n (%)	38 (8.4)	99 (22.0)	37 (29.1)	31 (23.8)	31 (15.9)
Number of red flags (0-12), median (IQR)	50 (11.0)	1 (0-2)	1 (0-2)	1 (0-2)	1 (0-1)
Pain on active range of motion, n (%)	9 (2.0)	295 (65.3)	86 (67.7)	88 (67.7)	120 (61.5)

GP: General practitioner; PT: Physiotherapist; Chiro: Chiropractor; IQR: Interquartile range; SD: Standard deviation; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
* The presented characteristics are pooled estimates based on multiple imputation procedures
^ AUDIT-C scores of ≥3/12 for women and ≥4/12 indicates hazardous alcohol consumption

Table 2: Multinomial regression analyses; multivariate associations between patient characteristics and choice of healthcare provider (dependent variable) *

	GP (n=127) Odds ratio (95% CI)	p-value	PT (n=130) Odds ratio (95% CI)	p-value
Block i) Sociodemographic variables				
Age	1.03 (0.99-1.07)	0.11	1.04 (1.00-1.08)	**0.03**
Gender				
Female	1.53 (0.96-2.45)	0.07	1.33 (0.83-2.12)	0.24
Male (ref.)	1.00		1.00	
Marital status				
Married/cohabiting	0.67 (0.38-1.19)	0.17	0.90 (0.51-1.61)	0.73
Not married/cohabiting (ref.)	1.00		1.00	
Educational level				
Higher education	1.02 (0.64-1.62)	0.94	1.08 (0.68-1.73)	0.73
Lower education (ref.)	1.00		1.00	
Employment status				
Currently in paid work	0.86 (0.46-1.62)	0.64	0.55 (0.30-1.01)	0.05
No paid work (ref.)	1.00		1.00	
Block ii) General health variables				
Hazardous alcohol intake (AUDIT-C)				
Yes	1.20 (0.73-1.97)	0.47	1.08 (0.64-1.81)	0.77
No (ref.)	1.00		1.00	
Smoking status				
Yes	1.18 (0.56-2.46)	0.67	0.64 (0.28-1.48)	0.29
Previously	1.31 (0.77-2.23)	0.32	1.11 (0.67-1.83)	0.70
No (ref.)	1.00		1.00	
Health-related quality of life (SF-36, 0-100)				
Physical component	0.96 (0.93-1.00)	**0.03**	0.98 (0.95-1.01)	0.19
Mental component	0.97 (0.95-1.00)	**0.02**	1.01 (0.98-1.03)	0.73
BMI	0.98 (0.93-1.04)	0.53	0.97 (0.92-1.02)	0.28
Comorbidities (SCQ, 0-15)	1.07 (0.86-1.33)	0.53	1.15 (0.95-1.40)	0.17
Widespread pain				
Yes	0.22 (0.06-0.81)	**0.02**	0.46 (0.18-1.16)	0.10
No (ref.)	1.00		1.00	
Falls self-efficacy (FES-I, 16-64)	1.00 (0.95-1.05)	0.98	1.03 (0.95-1.05)	0.32
Block iii) Current back pain and back pain history variables				
Back pain severity (NRS, 0-10)	1.02 (0.91-1.14)	0.77	0.90 (0.80-1.01)	0.08
Back-related disability (RMDQ, 0-24)	1.06 (1.00-1.12)	**0.04**	1.07 (1.01-1.13)	**0.02**
Duration				
Over 3 months	2.92 (1.28-6.66)	**0.01**	4.57 (1.99-10.50)	**<0.01**

6 weeks to 3 months	3.03 (1.27-4.97)	**0.02**	3.17 (1.28-7.84)	**0.01**
0-6 weeks (ref.)	1.00		1.00	
Morning stiffness				
Significant or extreme	0.76 (0.41-1.42)	0.39	1.21 (0.64-2.30)	0.55
Moderate	1.37 (0.74-2.56)	0.32	2.03 (1.08-3.81)	**0.03**
A little or none (ref.)	1.00		1.00	
Sleep problems attributable to back pain				
Weekly	1.09 (0.63-1.89)	0.76	0.75 (0.41-1.35)	0.33
Less than weekly (ref.)	1.00		1.00	
Previous back pain frequency				
Yearly	1.11 (0.65-1.92)	0.70	1.00 (0.59-1.69)	0.99
Not yearly (ref.)	1.00		1.00	
Block iv) Psychological variables				
Fear-avoidance (FABQ-PA, 0-24)	1.02 (0.98-1.07)	0.32	1.03 (0.98-1.08)	0.22
Pain catastrophizing (PCS, 0-52)	1.04 (1.00-1.07)	0.05	1.06 (1.02-1.10)	**<0.01**
Depression symptoms (CESD, 0-60)	0.99 (0.95-1.03)	0.53	0.99 (0.96-1.03)	0.61
Back beliefs (BBQ, 9-45)	0.97 (0.93-1.02)	0.23	0.99 (0.95-1.03)	0.67
Expectation for back pain in 3 months				
Recovered	0.26 (0.12-0.56)	**<0.01**	0.39 (0.19-0.79)	**0.01**
Much better	0.65 (0.35-1.19)	0.16	0.85 (0.46-1.58)	0.61
No change or worse (ref.)	1.00		1.00	
Start Back Screening tool risk category				
Medium + high risk	1.02 (0.55-1.87)	0.95	0.49 (0.26-0.92)	**0.03**
Low risk (ref.)	1.00		1.00	
Block v) Clinical variables				
Number of red flags (0-12)	1.25 (0.99-1.58)	0.06	1.19 (0.96-1.48)	0.12
Diagnostic tool for radiculopathy				
Positive	1.94 (1.08-3.47)	**0.03**	1.52 (0.85-2.73)	0.16
Negative (ref.)	1.00		1.00	
Pain on active range of motion				
Yes	0.95 (0.57-1.58)	0.85	1.09 (0.67-1.80)	0.72
No (ref.)	1.00		1.00	
Trunk mobility performance (BPS, 0-18)	1.16 (1.08-1.24)	**<0.01**	1.07 (1.00-1.15)	**0.04**
Timed Up and Go, mean seconds	0.93 (0.83-1.04)	0.20	1.00 (0.90-1.11)	0.93

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.

* The multinomial regression analyses are based on pooled estimates from multiple regression analyses

The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.

The chiropractic group (n=195) was the reference dependent variable.

Models were built block-wise within the five blocks: i) sociodemographic ii) general health iii) current episode and back pain history iv) psychological and v) clinical. All variables were included simultaneously.

SUPPLEMENTARY FILE

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Sensitivity analyses S1, complete case analyses:

Methods:

Multiple multinomial regression. One model per variable block. The total number of available cases per category will vary with number of missing for each block, and is thus shown for each block. Additionally, bootstrapping was performed for n=1000 bootstrapping samples. The average bootstrapping odds ratios and their corresponding bias-corrected accelerated 95% confidence intervals (BCa 95% CI) are provided. Because of few observations in the Start Back Screening Tool high risk group, we chose to combine this group with the medium risk group.

Results:

See Table S1 for details. No substantial changes in point estimates were detected in the multinomial regression analyses when comparing complete cases analyses to the pooled imputed estimates. There were, however, some changes in p-values. In the complete case analyses, age and being in the SBT medium risk group were not significantly associated with choosing a PT compared to a chiropractor. Further, in the complete case analyses, having more red flags were significantly associated with choosing a GP compared to a chiropractor. As can be seen from the bootstrapping procedure, odds ratios and BCa 95% CIs were stable for all variables, except for the SBT high risk group. Here, the BCa 95% CIs indicate that the odds ratios cannot be trusted for this specific variable.

Table S1: Complete case analyses of multiple multinomial regression analyses. Chiropractic group is the reference group.

Block i) Sociodemographic factors. Chiropractor n=181						
	GP (n=113) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Physio (n=108) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Age	1.03 (0.99, 1.08)	0.11	1.03 (0.99, 1.08)	1.03 (0.99, 1.07)	0.14	1.03 (0.98, 1.08)
Gender						
Female	1.33 (0.81, 2.17)	0.26	1.33 (0.80, 2.09)	1.40 (0.85, 2.33)	0.19	1.40 (0.82, 2.27)
Male (ref)	1.00		1.00	1.00		1.00
Marital status						
Married/cohabiting	0.66 (0.37, 1.19)	0.17	0.66 (0.36, 1.26)	0.92 (0.49, 1.72)	0.79	0.92 (0.48, 1.68)
Not married/cohabiting (ref)	1.00		1.00	1.00		1.00
Educational level						
Higher education	1.02 (0.63, 1.65)	0.95	1.02 (0.60, 1.70)	1.08 (0.66, 1.77)	0.77	1.08 (0.65, 1.79)
Lower education (ref)	1.00		1.00	1.00		1.00
Employment status						
Currently in paid work	0.96 (0.50 1.86)	0.91	0.96 (0.50, 1.78)	0.53 (0.27, 1.03)	0.06	0.53 (0.26, 1.00)
No paid work (ref)	1.00		1.00	1.00		1.00
Block ii) General health factors. Chiropractor n=155						
	GP (n=92) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Physio (n=89) Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Hazardous alcohol intake (AUDIT-C)						
Yes	1.23 (0.70, 2.15)	0.48	1.23 (0.67, 2.15)	1.67 (0.95, 2.92)	0.07	1.67 (0.96, 3.12)
No (ref)	1.00		1.00	1.00		1.00
Smoking						
Yes	1.37 (0.57, 3.26)	0.48	1.37 (0.44, 3.89)	0.63 (0.22, 1.76)	0.37	0.63 (0.16 1.64)
Previously	1.47 (0.82, 2.66)	0.20	1.47 (0.82, 3.16)	1.43 (0.81, 2.54)	0.22	1.43 (0.80, 2.78)

No (ref)	1.00		1.00	1.00		1.00
Health-related quality of life (SF-36, 0-100)						
Physical component	0.96 (0.92, 0.99)	**0.03**	0.96 (0.92, 0.99)	0.97 (0.94, 1.01)	0.96	0.97 (0.94, 1.01)
Mental component	0.95 (0.92. 0.98)	**0.002**	0.95 (0.92. 0.98)	1.00 (0.94, 1.07)	0.99	1.00 (0.97, 1.04)
BMI	0.99 (0.93, 1.06)	0.81	0.99 (0.92, 1.06)	1.00 (0.94, 1.07)	0.99	1.00 (0.92, 1.09)
Comorbidities (SCQ, 0-15)	1.02 (0.81, 1.29)	0.88	1.02 (0.76, 1.31)	1.12 (0.89, 1.41)	0.33	1.12 (0.90, 1.42)
Widespread pain						
Yes	0.16 (0.03, 0.79)	**0.03**	0.16 (0.07, 0.38)	0.50 (0.15, 1.67)	0.26	0.49 (0.10, 1.41)
No (ref)	1.00		1.00	1.00		1.00
Falls self-efficacy (FESI, 16-64)	1.00 (0.93, 1.05)	0.73	0.99 (0.92, 1.07)	0.99 (0.93, 1.06)	0.77	0.99 (0.92, 1.07)
Block iii) Current episode and back pain history. Chiropractor n=134						
	GP (n=80)			Physio (n=92)		
	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Back pain severity (NRS, 0-10)	1.06 (0.91, 1.22)	0.49	1.05 (0.90, 1.22)	0.94 (0.82, 1.08)	0.40	0.94 (0.82, 1.10)
Back-related disability (RMDQ, 0-24)	1.06 (0.99, 1.13)	0.12	1.06 (0.97, 1.14)	1.06 (0.99, 1.13)	0.11	1.06 (0.97, 1.15)
Duration						
Over 3 months	5.49 (2.34, 12.85)	**<0.001**	5.49(1.93, 22.47)	9.00 (4.03, 20.13)	**<0.001**	9.00 (3.53, 32.69)
6 weeks to 3 months	4.92 (1.92, 12.61)	**0.001**	4.92 (1.78, 36.27)	4.90 (1.91, 12.56)	**0.001**	4.90 (1.62, 18.99)
0-6 weeks (ref)	1.00		1.00	1.00		1.00
Morning stiffness						
Significant or extreme	1.02 (0.47, 2.24)	0.96	1.02 (0.54, 2.80)	1.23 (0.57, 2.67)	0.60	1.23 (0.56, 2.75)
Moderate	1.92 (0.88, 4.22)	0.10	1.93 (0.69, 5.55)	2.36 (1.09, 5.14)	**0.03**	2.36 (1.07, 5.75)
A little or none (ref)	1.00		1.00	1.00		1.00
Sleep problems attributable to back pain						
Weekly	0.82 (0.42, 1.62)	0.57	0.82 (0.33, 1.61)	0.77 (0.39, 1.52)	0.45	0.77 (0.38, 1.47)
Less than weekly (ref)	1.00		1.00	1.00		1.00
Previous back pain frequency						
Yearly	1.06 (0.57, 1.96)	0.57	1.06 (0.49, 2.14)	1.07 (0.58, 1.99)	0.82	1.07 (0.51, 2.17)
Not yearly (ref)	1.00		1.00	1.00		1.00
Block iv) Psychological factors. Chiropractor n=155						
	GP (n=96)			Physio (n=94)		
	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Fear-avoidance (FABQ-PA, 0-24)	1.03 (0.98, 1.09)	0.22	1.03 (0.98, 1.10)	1.03 (0.98, 1.08)	0.24	1.03 (0.98, 1.09)
Pain catastrophizing (PCS, 0-52)	1.02 (0.97, 1.06)	0.45	1.02 (0.97, 1.07)	1.05 (1.01, 1.10)	**0.02**	1.05 (1.01, 1.11)
Depression symptoms (CESD, 0-60)	1.00 (0.96, 1.04)	0.97	1.00 (0.95, 1.04)	0.99 (0.95, 1.04)	0.66	0.99 (0.94, 1.04)
Back beliefs (BBQ, 9-45)	0.97 (0.92, 1.02)	0.21	0.97 (0.92, 1.01)	0.99 (0.94, 1.04)	0.64	0.99 (0.94, 1.04)
Expectation for back pain in 3 months						
Recovered	0.24 (0.10, 0.54)	**0.01**	0.24 (0.09, 0.48)	0.43 (0.19, 0.95)	**0.04**	0.43 (0.19, 0.93)
Much better	0.57 (0.29, 1.12)	0.10	0.57 (0.28, 1.10)	0.83 (0.41, 1.68)	0.61	0.83 (0.40, 1.91)
No change or worse(ref)	1.00		1.00	1.00		1.00
Start Back Screening tool						
Medium+high risk	1.31 (0.68, 2.53)	0.42	1.31 (0.62, 2.83)	0.49 (0.24, 1.00)	0.05	0.49 (0.26, 0.86)
Low risk (ref)	1.00		1.00	1.00		1.00
Block v) Clinical variables. Chiropractor n=159						
	GP (n=105)			Physio (n=110)		
	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*	Odds ratio (95% CI)	p-value	OR (BCa 95% CI)*
Number of red flags (0-12)	1.30 (1.02, 1.67)	**0.04**	1.30 (0.97, 1.75)	1.26 (0.99, 1.60)	0.06	1.26 (0.98, 1.59)
Nerve involvement diagnostic tool						
Positive	2.34 (1.27, 4.31)	**0.01**	2.34 (1.23, 4.69)	1.70 (0.93, 3.14)	0.09	1.70 (0.91, 3.33)
Negative (ref)	1.00		1.00	1.00		1.00
Pain on active range of motion						
Yes	0.76 (0.43, 1.32)	0.33	0.76 (0.44, 1.28)	0.92 (0.54, 1.58)	0.77	0.92 (0.53, 1.64)
No (ref)	1.00		1.00	1.00		1.00
Physical performance (BPS, 0-18)	1.19 (1.10, 1.29)	**<0.001**	1.19 (1.11, 1.32)	1.10 (1.02, 1.19)	**0.01**	1.10 (1.02, 1.64)
Timed up and go, mean seconds	0.90 (0.79, 1.03)	0.14	0.90 (0.80, 1.02)	1.00 (0.88, 1.13)	0.94	1.00 (0.87, 1.13)

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire;

FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.
*OR (BCa 95% CI) is average odds ratios from 1000 bootstrapping samples, including bias-corrected accelerated 95% confidence intervals.

Sensitivity analyses S2, physiotherapy patients:

Analyses of differences between physiotherapy patients recruited before 01.01.2018 and after 01.01.2018. After 01.01.2018, there was direct access to physiotherapy in Norway, which potentially could change the population characteristics.

Methods:

- Univariate analyses corresponding to measurement level and distribution: Chi square test or Fischer's exact test for categorical variables, individual sample t-test for normally distributed continuous variables, Mann Whitney U-test for continuous variables with a skewed distribution
- We used the pooled estimates from multiple imputation that were used in the article table 1 and 2

Results:

See Table S2 for details. We found statistically significant differences between PT patients recruited before and after 01.01.2018 on the BBQ and BPS. PT patients recruited before 01.01.2018 held significantly more optimistic beliefs about back pain, with a mean (SD) BBQ score of 30.3 (6.8) for patients recruited before 01.01.2018 compared to 27.3 (7.5) for patients recruited after 01.01.2018 (p=0.03). PT patients recruited before 01.01.2018 had significantly better trunk mobility performance, with a median (IQR) of 5 (2-7) for patients recruited before 01.01.2018 compared to 7 (4-9.75) for patients recruited after 01.01.2018 (p=0.003).

Table S2: Univariate analyses of differences between physiotherapy patients recruited before and after 01.01.2018.

	Physio before (n=90)	Physio after (n=40)	p-value
Age, median (IQR)	68 (62.75, 73)	68.5 (61.5, 76)	0.323
Sex female, n (%)	53 (58.9)	17 (42.5)	0.084
Married or living with partner, n (%)	69 (76.7)	29 (72.5)	0.580
Paid work, n (%)	30 (33.3)	12 (30.0)	0.606
Education level			0.317
- Low (elementary+high school)	51 (56.7)	19 (47.5)	
- High (university> + uni 4+)	39 (43.3)	21 (52.5)	
Health-related quality of life			
- Mental sumscore, median (IQR)	56.29 (51.01, 60.99	54.63 (47.35, 60.37)	0.396
- Physical sumscore, mean (SD)	40.61 (7.91)	40.67 (8.30)	0.969
Hazardous alcohol consumption, n (%)	44 (48.9)	21 (52.5)	0.786
Smoking status			0.202
- Current smoker	9 (10)	4 (10)	
- Previous	46 (51.1)	14 (35)	
- Never	35 (38.9)	22 (55)	
Number of comorbidities, median (IQR)	2 (1, 2.25)	1 (1, 2)	0.235
BMI, median (IQR)	26.60 (24.41, 30.47)	26.37 (24.60, 29.27)	0.913

Fall last 6 weeks, n (%)	18 (20)	7 (17.5)	0.623
Falls self-efficacy, median (IQR)	20 (18, 23.35)	22.5 (17, 26.9)	0.424
Widespread pain, n (%)	5 (5.6)	2 (5.0)	0.880
Previous back pain, n (%)			0.479
- Monthly	35 (38.9)	11 (27.5)	
- Every year	30 (33.3)	14 (35.0)	
- Every 1-5 years	13 (14.4)	5 (12.5)	
- Every five years	8 (8.9)	8 (20.0)	
- Only once	4 (4.4)	2 (5.0)	
Duration of current episode, n (%)			0.538
- 0-6 weeks	30 (33.3)	11 (27.5)	
- 6 weeks to 3 months	17 (18.9)	11 (27.5)	
- 3 months or over	43 (47.8)	19 (47.5)	
Back pain, mean (SD)	5.22 (2.53)	4.69 (1.87)	0.208
Back-related disability, RMDQ, median (IQR)	8 (6, 13)	9.5 (4.25, 14)	0.808
Sleep problems due to back pain, n (%)			0.374
- Weekly	36 (40)	13 (32.5)	
- Less than weekly	54 (60)	27 (67.5)	
Morning stiffness, n (%)			
- Significant or extreme	35 (38.9)	16 (40)	0.753
- Moderate	35 (38.9)	13 (32.5)	
- Some or none	20 (22.2)	11 (27.5)	
Walking distance, n (%)			0.285
- More than 3km	40 (44.4)	16 (40.0)	
- 200m to 3km	41 (45.6)	16 (40.0)	
- Less than 200m	9 (10)	8 (20.0)	
Kinesiophobia (FABQ-PA), median (IQR)	10 (5, 15)	10.5 (5, 14)	0.842
Depression (CES-D), median (IQR)	8 (3.75, 14)	9.5 (5.25, 17.3)	0.305
Pain catastrophizing (PCS), median (IQR)	12 (5.3, 17)	11 (4, 19.6)	0.872
Back beliefs (BBQ), mean (SD)	30.3 (6.8)	27.3 (7.5)	**0.03**
Expectations for back pain next 3 months			0.821
- Fully recovered	17 (18.9)	7 (17.5)	
- Much better	50 (55.5)	21 (52.5)	
- No change or worse	23 (25.5)	12 (30.0)	
SBT risk profiles			0.163
- Low	68 (75.5)	24 (60)	
- Medium	18 (20)	14 (35)	
- High	4 (4.4)	2 (5)	
Physical performance (BPS), median (range)	5 (2, 7)	7 (4, 9.75)	**0.003**
Timed up and go, median (IQR)	7.99 (6.66, 9.18)	7.42 (6.64, 9.86)	0.655
Probable nerve root involvement, n (%)	20 (22.2)	13 (32.5)	0.194
Number of red flags, median (range)	1 (0, 2)	1 (0, 2)	0.815
Pain on active range of motion, n (%)	61 (67.8)	27 (67.5)	0.905

IQR: Interquartile range; SD: Standard deviation; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
AUDIT-C scores of ≥3/12 for women and ≥4/12 indicates hazardous alcohol consumption

Sensitivity analyses S3, only low back pain patients:

Methods:

Multiple multinomial regression. One model per variable block. The chiropractic group is the reference group. For these analyses, 382 patients were available; 106 GP patients, 109 physiotherapy patients, and 167 chiropractic patients.

Results:

See Table S3 for details. Overall, there were very few substantial changes in point estimates and p-values compared to the analyses of all included patients in the article main body. SF-36 physical component summary score was no longer significantly associated with first visiting a GP. Having widespread pain was significantly associated with visiting a physiotherapist compared to a chiropractor. Although point estimates for back-related disability was identical, it was no longer significantly associated with visiting a GP or a physiotherapist. For the Start Back Screening Tool, medium risk category was no longer significantly associated with visiting a chiropractor compared to a physiotherapist, but high risk was significant. Having a positive diagnostic rule for radiculopathy was significantly associated with visiting a physiotherapist compared to a chiropractor.

Table S3: Subgroup analyses of the multinomial regression analyses for patients with low back pain only. Chiropractic group (n=167) is the reference group.

Block i) Sociodemographic factors.				
	GP (n=106) Odds ratio (95% CI)	p-value	Physio (n=109) Odds ratio (95% CI)	p-value
Age	1.03 (0.99, 1.07)	0.23	1.04 (1.00, 1.08)	**0.05**
Gender				
Female	1.43 (0.86, 2.37)	0.17	1.31 (0.78, 2.19)	0.31
Male (ref)	1.00		1.00	
Marital status				
Married/cohabiting	0.58 (0.30, 1.09)	0.09	0.73 (0.38, 1.40)	0.34
Not married/cohabiting (ref)	1.00		1.00	
Educational level				
Higher education	0.97 (0.58, 1.61)	0.91	1.18 (0.71, 1.96)	0.52
Lower education (ref)	1.00		1.00	
Employment status				
Currently in paid work	0.79 (0.40, 1.55)	0.49	0.63 (0.31, 1.28)	0.20
No paid work (ref)	1.00			
Block ii) General health factors.				
Hazardous alcohol intake (AUDIT-C)				
Yes	1.19 (0.69, 2.05)	0.54	1.18 (0.69, 2.01)	0.54
No (ref)	1.00		1.00	
Smoking				
Yes	1.42 (0.64, 3.19)	0.39	0.64 (0.24, 1.71)	0.37
Previously	1.37 (0.75, 2.47)	0.30	1.02 (0.59, 1.77)	0.95
No (ref)	1.00		1.00	
Health-related quality of life (SF-36, 0-100)				
Physical component	0.97 (0.93, 1.00)	0.08	0.98 (0.94, 1.01)	0.20
Mental component	0.97 (0.94, 1.00)	**0.04**	1.00 (0.97, 1.03)	0.96
BMI	0.99 (0.93, 1.05)	0.76	0.96 (0.90, 1.02)	0.23
Comorbidities (SCQ, 0-15)	1.13 (0.90, 1.42)	0.29	1.18 (0.96, 1.47)	0.12
Widespread pain				
Yes	0.16 (0.04, 0.65)	**0.01**	0.30 (0.09, 0.99)	**0.05**
No (ref)	1.00		1.00	
Falls self-efficacy (FESI, 16-64)	1.00 (0.95, 1.05)	0.99	1.01 (0.95, 1.06)	0.85

Block iii) Current episode and back pain history.				
Back pain severity (NRS, 0-10)	0.98 (0.86, 1.11)	0.73	0.89 (0.78, 1.01)	0.07
Back-related disability (RMDQ, 0-24)	1.06 (1.00, 1.13)	0.05	1.06 (1.00, 1.13)	0.06
Duration				
Over 3 months	3.54 (1.42, 8.80)	**<0.01**	3.85 (1.69, 8.77)	**<0.01**
6 weeks to 3 months	3.40 (1.12, 10.37)	**0.03**	3.25 (1.16, 9.09)	**0.03**
0-6 weeks (ref)	1.00		1.00	
Morning stiffness				
Significant or extreme	0.79 (0.39, 1.60)	0.51	1.35 (0.68, 2.67)	0.39
Moderate	1.63 (0.82, 3.24)	0.16	2.02 (1.02, 4.03)	**0.05**
A little or none (ref)	1.00		1.00	
Sleep problems attributable to back pain				
- Weekly	1.13 (0.60, 2.14)	0.70	0.66 (0.34, 1.26)	0.20
- Less than weekly (ref)	1.00		1.00	
Previous back pain frequency				
- Yearly	1.03 (0.57, 1.87)	0.93	1.04 (0.59, 1.83)	0.88
- Not yearly (ref)	1.00		1.00	
Block iv) Psychological factors.				
Fear-avoidance (FABQ-PA, 0-24)	1.00 (0.95, 1.05)	0.97	1.03 (0.98, 1.08)	0.31
Pain catastrophizing (PCS, 0-52)	1.03 (0.99, 1.07)	0.20	1.06 (1.02, 1.10)	**<0.01**
Depression symptoms (CESD, 0-60)	0.97 (0.94, 1.03)	0.50	0.99 (0.95, 1.03)	0.70
Back beliefs (BBQ, 9-45)	0.96 (0.92, 1.01)	0.12	0.99 (0.94, 1.04)	0.63
Expectation for back pain in 3 months				
Recovered	0.21 (0.09, 0.49)	**<0.01**	0.34 (0.16, 0.73)	**<0.01**
Much better	0.60 (0.31, 1.16)	0.13	0.71 (0.36, 1.39)	0.31
No change or worse(ref)	1.00		1.00	
Start Back Screening tool				
High risk	1.82 (0.55, 6.05)	0.33	0.19 (0.04, 0.90)	**0.04**
Medium risk	1.03 (0.52, 2.06)	0.92	0.59 (0.30, 1.17)	0.13
Low risk (ref)	1.00		1.00	
Block v) Clinical variables.				
Number of red flags (0-12)	1.28 (0.98, 1.68)	0.07	1.16 (0.90, 1.50)	0.24
Diagnostic rule for radiculopathy				
Positive	2.32 (1.24, 4.34)	**<0.01**	1.89 (1.00, 3.57)	**0.05**
Negative (ref)	1.00		1.00	
Pain on active range of motion				
Yes	0.88 (0.50, 1.53)	0.64	1.06 (0.62, 1.80)	0.84
No (ref)	1.00			
Physical performance (BPS, 0-18)	1.19 (1.10, 1.28)	**0.03**	1.09 (1.01, 1.17)	**0.03**
Timed up and go, mean seconds	0.89 (0.78, 1.01)	0.06	0.97 (0.86, 1.09)	0.56

GP: General practitioner; PT: Physiotherapist; CI: Confidence interval; ref.: reference category; AUDIT-C: Alcohol Use Disorder Identification Test - Consumption questions; SF-36: Short Form Health Survey 36 Item; SCQ: Self-administered Comorbidity Questionnaire; FES-I: Falls Self-Efficacy Scale – International; NRS: Numeric Rating Scale; RMDQ: Roland-Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire – Physical Activity subscale; CES-D: Center for Epidemiological Studies – Depression; PCS: Pain Catastrophizing Scale; BBQ: Back Beliefs Questionnaire; BPS: Back Performance Scale.
The odds ratios for continuous variables represent the change in odds with a one-unit increase in the continuous variable.

Assessment of generalizability S4:

Table S4: Descriptive comparison of NORLAG sample and NORLAG 2017 musculoskeletal (MSK) subsample with BACE-N sample.

	NORLAG 2017 subsample MSK conditions^ (n=794)	**BACE-N (n=452)**
Age, median (IQR, range)	66 (60-74, 50-93)	66 (59-72, 55-89)
Gender female, n (%)	506 (63.7)	235 (52)
Mother tongue Norwegian (n=432), n (valid %)		412 (95.4)
Country of origin Norway, n (%)	728 (91.7)	
Educational level, n (%)		
- Low (elementary + high school)	566 (71.4)	253 (56.0)
- High (university level)	227 (28.6)	199 (44.0)
In paid work, n (%)	251 (31.6)	205 (45.3)
Living with partner, n (%)	494 (62.2)	347 (76.8)
BMI, mean (SD)	26.3 (4.4)	27.6 (4.7)
How many alcoholic units do you normally drink?~ n (valid %)		
- 1-2		
- 3-4		
- 5-6	183 (70.1)	289 (63.9)
- 7-9	62 (23.8)	136 (30.1)
- 10 or more	10 (3.8)	22 (4.8)
	1 (0.4)	2 (0.4)
	5 (1.9)	3 (0.7)
How often have you drunk alcohol until you felt intoxicated? (n=433) n, (valid %)		
- Once per week	12 (2.8)	
- 2-3 times per week	3 (0.7)	
- 2-3 times per month	18 (4.2)	
- Once per month	37 (8.5)	
- Rarely	235 (54.3)	
- Never	128 (29.6)	
How often do you drink 6 alcoholic units or more?		
- Almost daily		1 (0.2)
- Some days per week		3 (0.7)
- Some days per month		41 (9.1)
- Rarely		194 (42.9)
- Never		213 (47.1)
CES-D (IQR, range)	8 (4-14, 0-38)	8 (4-15, 0-46)
HR-QoL, physical summary score*, mean (SD)	37.5 (11.3)	41.4 (8.4)
HR-QoL, mental summary score*, mean (SD)	54.7 (8.2)	52.5 (10.0)
Walking distance		
- Cannot walk	13 (1.7)	
- A few steps	22 (2.8)	
- 10-100 m	59 (7.6)	
- 100-500m	57 (7.3)	
- 500m-1km	82 (10.5)	
- 1-5km	235 (30.1)	
- 5km+	313 (40.1)	
Walking distance		
- Less than 15m		20 (0.7)
- 15m-200m		310 (11.5)
- 200m-3km		1130 (42.1)
- 3km+		1218 (45.3)

IQR: Interquartile range; SD; Standard deviation; BMI: Body mass index; CES-D: Center for Epidemiological Studies – Depression questionnaire; HR-QoL: Health-related quality of life

^The subsample was collected in 2017 and consisted of participants aged 55 years or older, with at least one musculoskeletal condition

~ In NORLAG, this variable is continuously, as "number of alcoholic drunks usually drunk per time you drink alcohol". In BACE-N, it is the AUDIT-C question 2, a categorical question with 5 categories: 1-2, 3-4, 5-6, 7-9 and 10 or more.

*NORLAG used Short Form Health Survey-12, BACE-N used Short Form Health Survey-36

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*5-7*
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	8
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9, 19-20
		(b) Indicate number of participants with missing data for each variable of interest	9, 19-20
Outcome data	15*	Report numbers of outcome events or summary measures	9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-10, 20-21

		(*b*) Report category boundaries when continuous variables were categorized	6-7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10, suppl.
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.