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Original Article

Re-referrals to a Danish regional spine centre

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ABSTRACT

INTRODUCTION. In Denmark, general practitioners are the primary providers, referring patients to specialised spine care. Re-referral may indicate unresolved spinal pain, but can also reflect inefficiencies in patient management. This study determined the rate of re-referrals to a Danish regional spine centre within 500 days of the initial visit and identified patient-specific factors associated with re-referrals.

METHODS. A cohort study of patients at the Spine Centre of Southern Denmark was conducted from January 2019 to December 2023. Re-referrals were defined as visits between 50 and 500 days after the initial consultation. Factors investigated included referral diagnoses, patient-reported outcomes and clinical services initiated. Multivariable logistic regression identified associations with re-referral.

RESULTS. Among 30,872 patients, re-referrals were observed in 10.3% (n = 3,095). Previous back surgery (OR = 1.23), pain medication (OR = 1.37), MRI referrals (OR = 1.6), provision of rehabilitation plans (OR = 1.26), extremity pain (OR = 1.02) and loneliness (OR = 1.02) were associated with increased odds of re-referrals. In contrast, non-specific spinal pain diagnosis reduced the likelihood (OR = 0.83). Model discrimination was limited (Tjur's coefficient of discrimination (D) = 0.017), indicating weak predictive performance.

CONCLUSIONS. Re-referrals were common. Certain clinical factors were associated with re-referrals to a spine centre. Still, their predictive value was limited, making it difficult to recommend strategies to reduce re-referrals from general practice.

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General practitioners (GPs) are often the first point of contact for patients experiencing spinal pain, a condition that is highly prevalent, recurrent and among the leading causes of healthcare consultations [1]. Most spinal pain cases are categorised as "non-specific" and are best managed within primary care settings [2]. Even specific spinal conditions can often be effectively managed in primary care [3], though certain cases may require referral to hospital-based specialised services. Referrals may also be needed for patients with non-specific spinal pain who do not respond adequately to initial primary care interventions. However, the fluctuating nature of spinal pain can be challenging, often leading to uncertainty for both patients and GPs. This uncertainty may prompt hospital referrals, occasionally as a precautionary measure, "just to be on the safe side". Such referrals, especially repeated ones, are often unnecessary; they strain healthcare resources [4], may increase the risk of

chronicity and potentially cause harm through unnecessary diagnostic or interventional procedures [5, 6]. Distinguishing necessary from avoidable referrals is important for optimising patient care and resource use. Understanding the drivers of re-referrals and how GPs can navigate these complexities is important to improving spinal pain management in primary care. This study aims to determine the proportion of re-referrals and identify the patient-specific factors associated with re-referrals to a Danish regional hospital spine centre. Specifically, it investigates how referral diagnoses, patient-reported outcomes (PRO) and initiated clinical services influence re-referral likelihood. By identifying these factors, we aim to provide GPs with actionable insights to better manage their patients.

Methods

Settings

This cohort study was conducted at the Spine Centre of Southern Denmark, an outpatient hospital department providing specialised diagnostic services and treatment recommendations for patients with complex spinal pain conditions [7]. Services include advanced imaging, surgical consultations and referrals for conservative treatment. During the study period, a three-month trial of conservative treatment was a prerequisite for referral to the Spine Centre.

Data source and collection

This study used three types of data: 1) the referral diagnosis, 2) PRO and 3) initiated clinical services. All data types were obtained through electronic health records. The sample included all Spine Centre patients between January 2019 and December 2023.

Referral diagnosis

The referral diagnoses were categorised into predefined groups to allow for standardised analysis across varied clinical presentations:

• Radiculopathies: Conditions involving nerve root compression causing pain, numbness or limb weakness.

• Spinal stenosis: Narrowing of the spinal canal leading to neurogenic claudication.

• Specific spinal pain: Pain attributable to a specific spinal pathology (e.g., fracture, infection).

• Non-specific spinal pain: Pain without a specific identifiable cause.

• Non-specific non-spinal pain: Pain without a specific identifiable cause unrelated to spinal structures.

• Specific non-spinal pain: Pain from specific non-spinal conditions.

• Generalised/widespread pain: Conditions like fibromyalgia involving widespread pain.

• Other.

Patient-reported outcomes

PRO data were extracted from the local clinical PRO registry, SpineData. An initial set of PRO variables was selected based on their theoretical and clinical relevance, including screening questions and validated instruments:

• Numeric Pain Rating Scale: This scale measures pain intensity on a scale from 0 (no pain) to 10 (worst possible pain), where higher scores indicate greater pain [8].

• Disability (the Oswestry Disability Index, the Neck Disability Index, and the Roland Morris Questionnaire)

assesses disability due to spinal pain, with scores z-normalised to have a mean of 0 and a standard deviation (SD) of ± 1. Higher normalised scores indicate greater disability [9-11].

• The EuroQol-5D (EQ-5D): Assesses health-related quality of life via the EQ-5D visual analogue scale (range: 0-100), where higher scores indicate better-perceived health [12].

• The STarT Back Screening Tool: A nine-item tool assessing the risk of chronicity [13].

• The Pain Catastrophizing Scale: Assesses catastrophic thinking related to pain, with scores ranging from 0 to 52; higher scores reflect more severe catastrophising [14].

• The Fear-Avoidance Beliefs Questionnaire (FABQ): Measures fear-avoidance beliefs regarding physical activity and work, with subscale scores ranging 0-42 and 0-24, respectively; higher scores indicate stronger fear-avoidance beliefs [15].

Clinical services

Clinical services initiated at the Spine Centre included:

• Diagnostic spine-related imaging.

• Provision of rehabilitation plans.

A detailed table of all data is provided in Appendix A.

Data presentation and manipulation

Re-referrals were defined as any new referral for a clinical evaluation occurring between day 50 and day 500 after a previous clinical evaluation. The lower limit was chosen to exclude administrative duplicates and immediate follow-ups, whereas the upper limit represented a reasonable threshold distinguishing a re-referral for the same spinal complaint from a new referral for a different complaint or a significant development in the previous one. To ensure an adequate observation period for detecting re-referrals, patients whose first recorded referral occurred within the first 500 days of the study period were excluded from the analysis. These were pragmatic choices based on our experience with typical patient pathways in the department. Missing PRO data were addressed by assigning explicit values to non-responses and inapplicable questions. For questions where patients did not answer, missing data was assigned as “not answered.” SpineData uses logical forking algorithms to omit irrelevant sub-questions. In these instances, “not relevant” was assigned.

Statistical analysis

Patient characteristics were described using summary statistics. The number of re-referrals was counted. A multivariable logistic regression model without interaction terms was used, with re-referral as the binary dependent variable. All variables included in the regression models were recorded during the initial consultation. An automated model selection approach using the Bayesian Information Criterion (BIC) was used to identify the variables with the strongest associations to re-referrals. This heuristic search method enabled a computationally efficient assessment of multiple combinations without evaluating all possible models. The final model selection was chosen by comparing the best-performing model based on the BIC with an alternative frequency-based model that included only variables present in 80% or more of the top-performing models. Logistic regression assumptions (e.g., multicollinearity) were not violated. Results are presented as Tjur’s coefficient of discrimination (D) [16] and ORs with 95% CI for being re-referred. All analyses were conducted using R v.4.4.1 [17].

Data sharing statement

Deidentified participant data, including PRO, clinical data on re-referrals and aggregated results, will be shared upon reasonable request. Data will be available for five years after publication to researchers with methodologically sound proposals for replication of results or further analysis. Requests should be directed to the corresponding author.

Trial registration: not relevant.

Results

A total of 30,872 patients were included in the analysis, with a mean age of 55 years (SD: ± 16). Among these, 56% were female. Re-referrals were identified in 3,095 patients (10.3%). Demographics, referral diagnoses, PROs, and clinical services are provided in Appendix A. **Figure 1** illustrates the selection process, which begins with the study sample and proceeds to those included in the analyses. **Table 1** presents the results of the multivariable logistic regression model, and absolute re-referral rates for diagnostic categories are presented in **Table 2**. Based on the BIC, the model selection identified 14 key variables to include in the best regression model. After inspection, the model with the lowest BIC was superior to the frequency-based model. Tjur's D was 0.017, indicating that the model had limited ability to discriminate between re-referred and non-re-referred patients based on the included predictors. A visual representation of predicted probabilities by re-referral status is provided in Appendix B.

FIGURE 1 Study flow diagram of the participant selection and data cleaning process

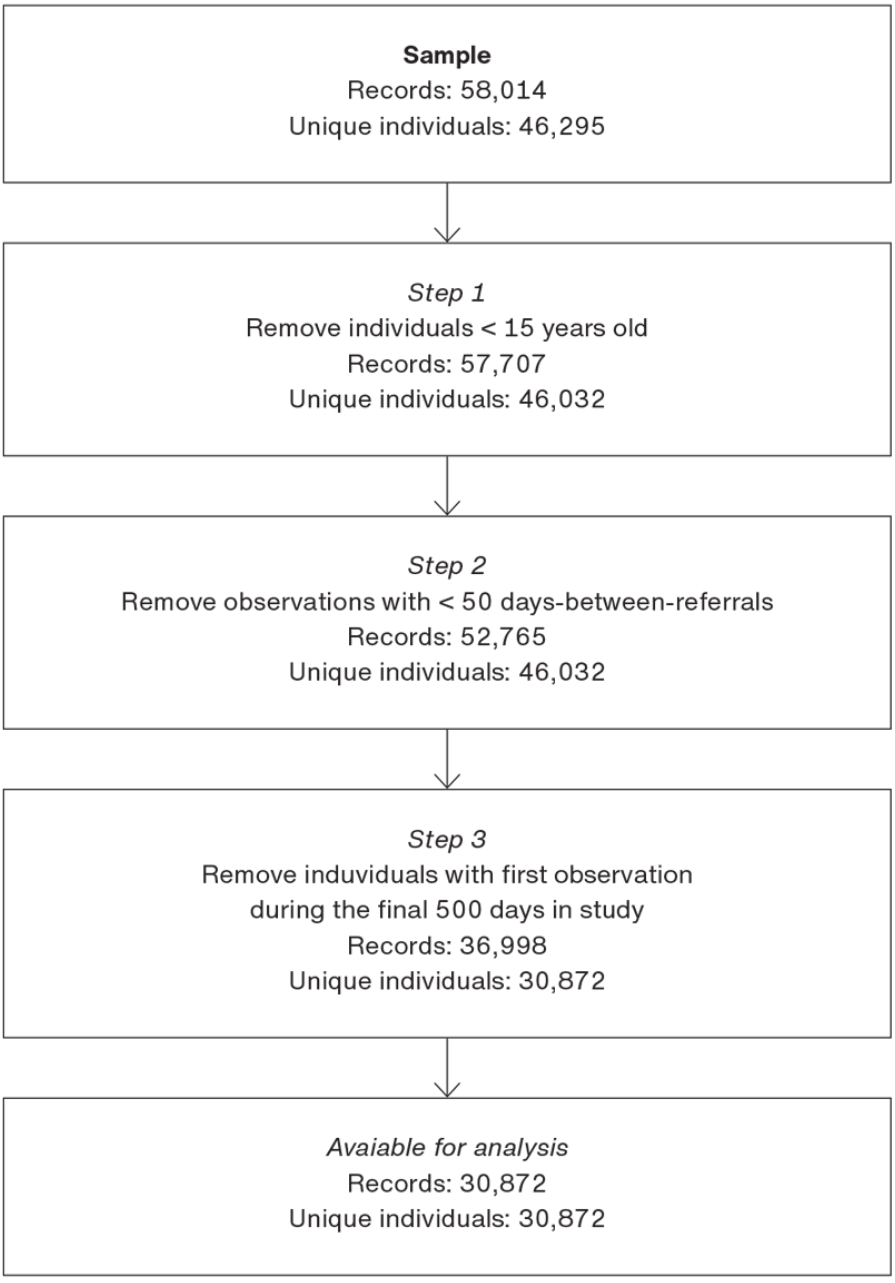

TABLE 1 Regression analysis: predictors of outcome for spine-related re-referrals. The table presents ORs (95% CI), and p values for baseline characteristics as predictors in two models: the "Best Model" and an "Alternative Model." The reference category for each categorical variable is denoted.

	Best model		Alternative model	
Baseline characteristic	**OR (95% CI)**	**p value**	**OR (95% CI)**	**p value**
Previous spine surgery?				
No	Ref.			
Yes	1.23 (1.09-1.39)	0.001		
Recreational activity level				
Sedentary	Ref.		Ref.	
Moderate	1.09 (0.97-1.22)	0.2	1.08 (0.96-1.22)	0.2
Active	0.96 (0.82-1.12)	0.6	0.95 (0.81-1.11)	0.5
Vigorous	0.74 (0.44-1.17	0.2	0.72 (0.43-1.15)	0.2
Pain medication?				
No	Ref.		Ref.	
Yes	1.37 (1.20-1.57)	< 0.001	1.38 (1.21-1.58)	< 0.001
Not answered	2.08 (1.30-3.20)	0.001	2.03 (1.27-3.12)	0.002
MRI referral?				
No	Ref.		Ref.	
Yes	1.60 (1.45-1.76)	< 0.001	1.61 (1.46-1.77)	< 0.001
Rehabilitation plan given?				
No	Ref.		Ref.	
Yes	1.26 (1.07-1.48)	0.005	1.26 (1.07-1.47)	0.005
Neck or low back pain intensity	1.02 (1.0-1.05)	0.12	1.02 (1.0-1.05)	0.13
Extremity pain intensity	1.02 (1.00-1.04)	0.023	1.02 (1.01-1.04)	0.013
Anxiety	1.01 (0.99-1.03)	0.4	1.01 (0.99-1.02)	0.5
EQ5D, VAS	1.00 (1.00-1.00)	0.3	1.00 (1.00-1.00)	0.2
Perceived risk of chronicity	0.98 (0.96-1.00)	0.10	0.98 (0.96-1.01)	0.15
Loneliness	1.02 (1.00-1.04)	0.043	1.02 (1.00-1.04)	0.043
Referral diagnosis of spine non-specific?				
No	Ref.		Ref.	
Yes	0.83 (0.74-0.92)	< 0.001	0.82 (0.74-0.91)	< 0.001
Disability[a]	1.03 (0.96-1.09)	0.4	1.03 (0.97-1.10)	0.3
Fear of movement	0.99 (0.98-1.01)	0.5	0.99 (0.98-1.01)	0.5

EQ5D, VAS = EuroQol, visual analogue scale; ref. = reference; SD = standard deviation.
a) Disability score is Z-scaled (mean = 0, SD = ± 1).

TABLE 2 Absolute re-referral probabilities by initial referral diagnosis. The table includes the number of total sample sizes, number of re-referred and corresponding percentage for each diagnostic category.

		Re-referral	
Referral diagnosis	**Total, N**	**n**	**probability, %**
Radiculopathies	3,962	480	12.1
Spinal stenosis	2,381	343	14.4
Spinal pain			
Specific	1,552	158	10.2
Non-specific	17,525	1,714	9.8
Non-spinal pain			
Non-specific	839	71	8.5
Specific	1,078	98	9.1
Generalised/widespread pain	741	56	7.6
Other	1,110	127	11.4

Patients diagnosed with non-specific spinal pain had a lower likelihood of re-referral (OR = 0.82 (95% CI: 0.74; 0.91), $p < 0.01$). Self-reports of previous treatment, clinical symptoms and psychosocial factors were also associated with re-referral. Previous back surgery was associated with a 23% increase in the likelihood of re-referral (OR = 1.23 (95% CI: 1.09; 1.39), $p < 0.01$). The use of pain medication was linked to a 37% increase (OR = 1.37 (95% CI: 1.20; 1.57), $p < 0.01$), whereas not answering this question increased the likelihood (OR = 2.08 (95% CI: 1.30; 3.20), $p < 0.01$). Higher extremity pain intensity was associated with re-referral (OR = 1.02 (95% CI: 1.01; 1.04), $p < 0.02$), and loneliness was weakly associated (OR = 1.02 (95% CI: 1.00; 1.04), $p < 0.04$). Initiating imaging was associated with a 60% increase in the likelihood of re-referral (OR = 1.60 (95% CI: 1.45; 1.76), $p < 0.01$), whereas the provision of a rehabilitation plan increased the odds of re-referrals by 26% (OR = 1.26 (95% CI: 1.07; 1.48), $p < 0.01$).

Discussion

Our findings highlight the challenges that GPs face in managing spinal pain, particularly in identifying patients at risk of re-referral. Approximately 10% of patients were re-referred, suggesting persistent management difficulties. Factors significantly associated with re-referral included previous back surgery, diagnostic imaging and rehabilitation plans, indicating that patients already engaged with comprehensive healthcare services are more likely to receive additional specialist care. GPs should be particularly attentive to these patients and

consider alternative approaches to prevent unnecessary referrals. Surprisingly, patients diagnosed with non-specific spinal pain had decreased odds of re-referral, despite its association with higher magnetic resonance imaging (MRI) re-referral rates [18].

It is important to recognise that this study cannot determine whether re-referrals represent necessary care or low-value utilisation. They may reflect unresolved symptoms requiring specialised intervention or over-utilisation of hospital services. However, the fact that 10% of patients were re-referred within 500 days highlights the need for careful evaluation, especially when the clinical presentation remains unchanged. Notably, 14% of re-referred patients were referred multiple times, possibly indicating unresolved symptoms, dissatisfaction or unmet needs.

However, the explanatory power of the model was limited. Tjur's D was 0.017, indicating that the average predicted probability of re-referral was only 1.7 percentage points higher among patients who were re-referred than among those who were not. This reflects a weak ability to discriminate between outcome groups. While more statistically significant predictors were identified, many influential factors likely remain unmeasured. These could include socioeconomic status, health literacy, patient self-efficacy and satisfaction or trust in their GP. Although a D of 0.017 may appear low, predicting real-world healthcare utilisation is inherently complex, and it is shaped by variability in patient trajectories and clinical decision-making. We found no directly comparable studies to benchmark this result, but given that we employed a nearly exhaustive modelling approach using all available baseline data, the limited discrimination underscores the challenge of predicting re-referral in this context.

Predicting re-referrals remains challenging, but understanding the key clinical factors identified in this study provides insights into potential risks. For example, previous back surgery and diagnostic imaging were significantly associated with re-referrals, suggesting that these patients may have more complicated medical needs that require thorough assessment and possible proactive management to prevent the cycle of referrals and re-referrals. GPs might benefit from structured follow-up plans, e.g., involving other allied health professions, to ensure that these high-risk groups receive adequate support at the primary care level. Additionally, improving communication between referring practitioners and the Spine Centre could help optimise referral decisions, potentially reduce avoidable re-referrals and ensure that patients receive appropriate care at the right time and place.

Re-referrals are influenced by multiple factors, including the Spine Centre's discharge practices. Some re-referrals may reflect implicit or explicit advice to seek re-evaluation if symptoms persist. However, we had no access to data indicating whether such recommendations were systematically provided. This limits our ability to assess how discharge decisions or follow-up planning contributed to subsequent re-referrals. Moreover, following diagnostics, patients are either referred for surgery, transitioned to general practice or directed towards municipal rehabilitation or self-management. As prolonged follow-up at the Spine Centre is not feasible within the current healthcare structure, this may contribute to re-referrals when patients experience persistent or worsening symptoms. Nonetheless, GPs should consider whether these repeated referrals reflect appropriate care or whether there is an opportunity to address underlying issues more effectively within primary care. This could involve enhanced patient education regarding the natural course of spinal pain and promoting self-management strategies, as recommended in the literature [19, 20]. Providing patients with realistic expectations and empowering them to manage symptoms may help reduce reliance on specialist services and improve overall outcomes.

Limitations

As an observational study, unaccounted confounders may have influenced our findings. Data from a single

region in Denmark limit the study's generalisability. The COVID-19 pandemic occurred during the study period, affecting healthcare communication and referral patterns, though its specific impact was not analysed. Additionally, data were extracted from a single time point, preventing assessment of longitudinal factors such as repeated MRI referrals or symptom progression. Because the analyses were based solely on data from the initial consultation, we cannot assess whether symptom deterioration, new clinical findings, or disease progression prompted re-referrals, which limits our ability to infer causal pathways.

Conclusions

Re-referrals to the Spine Centre were common. While certain clinical factors were associated with re-referrals, their overall predictive ability was limited, making it difficult to suggest specific recommendations for reducing unnecessary re-referrals from general practice.

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REFERENCES

1. Chen Q, Berg B, Grotle M, et al. Primary care seeking among adults with chronic neck and low back pain in Norway: a prospective study from the HUNT study linked to Norwegian primary healthcare registry. Eur J Pain. 2024; 28(10):1799-1810. https://doi.org/10.1002/ejp.2310
2. Bardin LD, King P, Maher CG. Diagnostic triage for low back pain: a practical approach for primary care. Med J Aust. 2017;206(6):268-273. https://doi.org/10.5694/mja16.00828
3. Corp N, Mansell G, Stynes S, et al. Evidence-based treatment recommendations for neck and low back pain across Europe: a systematic review of guidelines. Eur J Pain. 2021;25(2):275-295. https://doi.org/10.1002/ejp.1679
4. Mathieu J, Robert MÈ, Châtillon CÉ, et al. Appropriateness of specialized care referrals for LBP: a cross-sectional analysis. Front Med (Lausanne). 2024;10:1292481. https://doi.org/10.3389/fmed.2023.1292481
5. Feise RJ, Mathieson S, Kessler RS, et al. Benefits and harms of treatments for chronic nonspecific low back pain without radiculopathy: systematic review and meta-analysis. Spine J. 2023;23(5):629-641. https://doi.org/10.1016/j.spinee.2022.11.003
6. Deyo RA, Mirza SK, Turner JA, Martin BI. Overtreating chronic back pain: time to back off? J Am Board Fam Med. 2009;22(1):62-68. https://doi.org/10.3122/jabfm.2009.01.080102
7. Hansen A, Morsø L, Stochkendahl MJ, et al. Demographic and clinical characteristics of patients with low back pain in primary and secondary care settings in Southern Denmark. Scand J Prim Health Care. 2023;41(2):152-159. https://doi.org/10.1080/02813432.2023.2196548
8. Jensen MP, Karoly P, Braver S. The measurement of clinical pain intensity: a comparison of six methods. Pain.

1986;27(1):117-126. https://doi.org/10.1016/0304-3959(86)90228-9

9. Fairbank JCT, Pynsent PB. The Oswestry Disability Index. Spine. 2000;25(22):2940-52. https://doi.org/10.1097/00007632-200011150-00017
10. Roland M, Morris R. A study of the natural history of back pain. Part I: development of a reliable and sensitive measure of disability in low-back pain. Spine (Phila Pa 1976). 1983;8(2):141-144. https://doi.org/10.1097/00007632-198303000-00004
11. Vernon H, Mior S. The Neck Disability Index: a study of reliability and validity. J Manipulative Physiol Ther. 1991;14(7):409-415
12. EuroQol Group. EuroQol - a new facility for the measurement of health-related quality of life. Health Policy. 1990;16(3):199-208. https://doi.org/10.1016/0168-8510(90)90421-9
13. Hill JC, Dunn KM, Lewis M, et al. A primary care back pain screening tool: identifying patient subgroups for initial treatment. Arthritis Rheum. 2008;59(5):632-641. https://doi.org/10.1002/art.23563
14. Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: development and validation. Psychol Assess. 1995;7(4):524-532. https://doi.org/10.1037/1040-3590.7.4.524
15. Waddell G, Newton M, Henderson I, et al. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. Pain. 1993;52(2):157-168. https://doi.org/10.1016/0304-3959(93)90127-B
16. Tjur T. Coefficients of determination in logistic regression models - a new proposal: the coefficient of discrimination. Am Stat. 2009;63(4):366-372. https://doi.org/10.1198/tast.2009.08210
17. R Core Team. R: A Language and environment for statistical computing. R Foundation for Statistical Computing; 2024. https://www.R-project.org/
18. Danish Health Service Quality Institute. [Danish Spine Database - DaRD Annual Report 2022: Reporting period from July 1, 2021, to June 30, 2022]. Danish Health Service Quality Institute, 2023. https://sundk.dk/kliniske-kvalitetsdatabaser/dansk-rygdatabase-dard/nyheder-fra-dansk-rygdatabase-dard/aarsrapport-2023-fra-dansk-rygdatabase-dard/
19. Louw A, Diener I, Butler DS, Puentedura EJ. The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. Arch Phys Med Rehabil. 2011;92(12):2041-2056. https://doi.org/10.1016/j.apmr.2011.07.198
20. Traeger AC, Lee H, Hübscher M, et al. Effect of intensive patient education vs placebo patient education on outcomes in patients with acute low back pain: a randomized clinical trial. JAMA Neurol. 2019;76(2):161-169. https://doi.org/10.1001/jamaneurol.2018.3376

