The prevalence of serious pathology in musculoskeletal physiotherapy patients – a nationwide register-based cohort study

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Abstract

Background: Musculoskeletal conditions are the single largest contributor to years lived with disability worldwide. Most musculoskeletal conditions can be managed and treated in primary care, but for a small proportion of these patients the symptoms are caused by serious pathology. Although the general practitioner usually performs initial screening for serious pathology, evaluation and treatment by physiotherapists are often part of the treatment pathway. It is however unclear, how many patients in primary care physiotherapy have symptoms caused by a serious pathology. Historically the prevalence of serious pathology in primary care has been investigated in small populations with spine specific conditions, thus a more general prevalence in the group of patients with musculoskeletal conditions is yet to be estimated. Therefore, the aim of this study was to estimate the prevalence of neoplasm, cauda equina syndrome, spinal fracture, infection and inflammatory pathology among patients referred for musculoskeletal physiotherapy evaluation and treatment.

Methods: The study was a prospective nationwide register-based cohort study. We identified all referrals for primary care musculoskeletal physiotherapy in the Danish National Health Insurance Service Register between 1 January 2014 and 31 December 2017. Records of hospital contacts were extracted from the Danish National Patient Register within 180 days from first physiotherapy contact, identifying all diagnoses of serious pathology. Period prevalence proportions with 95%CI of the serious pathology categories were estimated.

Results: A total of 1,568,704 courses of treatment were included in the analysis. The overall prevalence of serious pathology was 2.30%.The prevalence of neoplasm was 2.11%, of which 1.13% was malignant neoplasms. The prevalence of cauda equina syndrome was 0.01%, fractures 0.13%, infections 0.01% and inflammatory pathology of the spine 0.06%. Higher prevalence's were observed among patients with a previous history of serious pathology, aged above 50 and more comorbidity.

Conclusions: Although serious pathology among musculoskeletal physiotherapy patients is rare, the present study found an overall prevalence of serious pathology which exceeded the guideline endorsed prevalence estimates of serious pathology of 1%.

Background

Musculoskeletal conditions are the single largest contributor to years lived with disability worldwide (1). These conditions are typically characterised by pain and disability, which may have substantial consequences for the affected individual causing reduced ability to work or limited participation in social activities (2). Most of the musculoskeletal conditions are considered benign and non-specific. However, a small proportion of patients with musculoskeletal conditions have an undiscovered serious pathology causing their symptoms (3). Previously, serious pathology among patients with musculoskeletal disorders have mainly focused on spine specific pathologies, such as spinal malignant neoplasms, fractures, cauda equine syndrome, spinal infections and axial spondylarthritis (4,5). Early identification of these serious pathologies is of great importance because they necessitate timely and correct diagnosis and treatment, which cannot be provided in primary care settings (3).

Initial screening for these serious pathologies is usually performed by the General Practitioner (GP), and although the screening is primarily described in spine specific guidelines (3–5), it is important for all musculoskeletal conditions. It is commonly acknowledged, that serious pathology in the group of patients with musculoskeletal conditions is rare. Historically the prevalence of serious pathology has been investigated in populations with spine specific conditions, and a more general prevalence in the group of patients with musculoskeletal conditions is yet to be estimated. European guidelines suggests that 1% of LBP patients in primary care have a serious pathology causing their musculoskeletal symptoms (3,4). Of these serious pathologies, fractures and malignancy are most common, while cauda equine syndrome and spinal infections are less common with an estimated prevalence of 0.04% and 0.01% respectively (6).

Although the initial screening for serious pathology in primary care is usually performed by the GP, other healthcare providers also play a central role in the treatment pathway. In Denmark, GP's acts as gatekeepers into the healthcare system, meaning most patients with musculoskeletal conditions seek the GP, who then examine and refer the patient to appropriate treatment. Often this treatment will include primary care physiotherapy. While screening for signs and symptoms of serious pathologies is also part of the physiotherapy guidelines, no studies have yet investigated how many patients diagnosed with serious pathology have been treated in primary care physiotherapy. Thus, the aim of this study was to estimate the prevalence of neoplasm, cauda equina syndrome, spinal fractures, infections and inflammatory pathology in patients referred for musculoskeletal physiotherapy treatment.

Methods

Design and registers

The study was a prospective nationwide register-based cohort study. The present study builds on data from two healthcare registries; 1) The Danish National Health Insurance Service Register (NHSR), which contains daily information on physiotherapy interventions received in private primary care since 1990 with the exception of self-paid therapy without reimbursement (7), and 2) the Danish National Patient Register (NPR) (8), which includes information on hospital diagnoses and contact dates for all in- and outpatient contacts in public and private somatic hospitals in Denmark. In NPR there is a primary diagnose and up to several secondary diagnoses describing each patient's individual course of treatment. Diagnoses are coded using the International Classification of Diseases and Related Health Problems (ICD-10) system (9). The study was reported as recommended in the RECORD checklist (extended STROBE checklist) (10).

Population

In Denmark, national healthcare registries provide individual-based records of contact to the healthcare system for the entire population (11). In the present study all records of referrals for musculoskeletal physiotherapy treatment between 1.1.2014 and 31.12.2017 was identified through the NHSR. Each referral with a contact to the physiotherapist represented a *course of treatment* in the study meaning the study population consists of observations (courses of treatment) and the individual patient could be represented by several courses of treatment during the study period. The first contact date had to be within 365 days from the referral date, and each course of treatment had a follow up period of 180 days from first contact

date. The study was approved by the Danish Data Protection Agency (No. 1-16-02-41-19). Under Danish law, this study did not need ethics approval (Act on Research Ethics Review of Health Research Projects, October 2013) (12).

Serious pathology

All records of primary hospital diagnose within 180 days from first contact with the physiotherapist was obtained from NPR, identifying all diagnoses of serious pathology in the study population. Each diagnose represented a case and patients could potentially be diagnosed with more than one serious pathology in the study period. We included five categories of serious pathology (table 1), which not only represent spine specific conditions, but also more general serious pathologies such as benign neoplasms.

Table 1: Categories of serious pathology		
Category	*ICD-10*	*Specification*
Neoplasms	DC00-DC96	Malignant neoplasms
	DD00-DD09	In situ neoplasm
	DD10-DD36	Benign neoplasms
	DD37-DD48	Neoplasms of uncertain behaviour
Cauda Equina	DG834	Cauda Equina syndrome
Fracture	DM484	Fatigue fracture of vertebra
	DM485	Collapsed vertebra
	DM80	Osteoporosis with pathological fracture
Infection	DA17	Tuberculosis of nervous system
	DA180	Tuberculosis of bones and joints
	DM49	Spondylopathies in diseases classified elsewhere
	DM86	Ostemyelitis
Inflammatory	DM023	Reiter's disease
	DM072	Psoriatic spondylitis
	DM081	Juvenile ankylosing spondylitis
	DM45	Ankylosing spondylitis
	DM46	Other inflammatory spondylopathies

Statistical analysis

The flow of observations was described and descriptive characteristics of the cohort were presented. Period (180 days) prevalence proportions of serious pathology were calculated and presented as prevalence estimates with 95% confidence interval (95% CI). Sensitivity analysis was performed on the prevalence proportions by including both primary and secondary ICD-10 diagnoses codes from DNPR. Prevalence estimates were calculated only including each patient's first course of treatment, thereby changing the cohort from observations to individual patients. For the categories neoplasm, fracture and inflammatory pathologies, prevalence estimates were calculated and presented stratified into previously diagnosed with a similar pathology or not. For each of these categories, the following characteristics were presented: 1) G*ender*, 2) *age* divided into <50 / ≥50 years of age at first contact to physiotherapist and 3) *comorbidity*

based on the revised Charlson comorbidity index (13,14) using ICD-10 diagnoses from the DNPR the last 10 years. The original scale from 0-24 were divided into 0 (no comorbidity) and >0 (comorbidity).

All statistical analyses were performed using STATA version 15.0 (StataCorp LP, College Station, TX, USA).

Results

A total of 1,708,474 first contacts to a physiotherapist were made in the study period. Of these, 130,887 courses of treatment were excluded because the patient had more than one active course of treatment. Additional 8,753 courses of treatment were excluded because the patient died (n = 7,368) or migrated (n = 1,385) within 180 days from first contact to the physiotherapist. A further 130 courses of treatment were excluded because of missing data on age and gender. Hence, the study population consisted of 1,568,704 courses of treatment. The study population was characterized as presented in table 2.

Table 2: Characteristics of study population (n = 1,568,704)		
Gender, n (%)		
Female	993,959	(63)
Male	574,745	(37)
Age, mean (SD)	51	(19)
CCI (0−24), n (%)		
0	1,357,039	(87)
1−24	211,795	(13)
Course of treatment, median [IQR]		
Days from referral to first treatment	8	[2;19]
Treatment days in course of treatment	5	[3;10]
Prevalence of serious pathology (95%CI)		
Neoplasm	2.11	(2.10;2.13)
Cauda equina	0.01	(0.00;0.01)
Fracture	0.13	(0.12;0.13)
Infection	0.01	(0.01;0.01)
Inflammatory	0.06	(0.06;0.07)
Any serious pathology	2.30	(2.28;2.32)
Abbreviations: CCI, Charlson Comorbidity Index; CI, Confidence Interval; IQR, Inter Quartile Range; n, number of observations; SD, Standard Deviation		

The prevalence of neoplasm was 2.11%, of which 1.13% was malignant neoplasms. The prevalence of cauda equina syndrome was 0.01%, fractures 0.13%, infections 0.01% and inflammatory diseases of the spine 0.06%. Changing the included diagnoses to both primary and secondary diagnoses had little impact on the estimated prevalence, changing the any serious pathology estimate to 2.60% (data not shown). Only including the first course of treatment for each patient did not change the estimated prevalence (n = 1,101,948).

Table 3 presents prevalence estimates of neoplasms, fracture and inflammatory pathology. In all of the pathology categories, there was a lower prevalence among patients who had not been diagnosed with the same pathology previously. Among those not previously diagnosed, patients over the age of 50 or patients with co-morbidity had higher prevalence estimates in the neoplasm and fracture pathology categories. In the inflammatory pathology category only minor differences in prevalence estimates were detected.

Table 3: Prevalence of neoplasm, fracture and inflammatory pathology within 180 days from first treatment date divided into courses of treatment with no previous diagnose and previously diagnosed.

	No previous diagnose			Previously diagnosed		
	Observations (n)	Prevalence (%)	CI 95%	Observations (n)	Prevalence (%)	CI 95%
Malign neoplasm						
Overall[1]	1,451,923	0.64	(0.63;0.65)	116,781	7.26	(7.11;7.41)
Gender						
Female	915,969	0.61	(0.59;0.62)	77,990	6.45	(6.28;6.62)
Male	535,954	0.69	(0.67;0.72)	38,791	8.89	(8.61;9.18)
Age						
< 50	685,545	0.13	(0.12;0.14)	23,304	3.63	(3.39;3.88)
≥ 50	766,378	1.10	(1.07;1.12)	93,477	8.16	(7.99;8.34)
Comorbidity						
No	1,298,554	0.49	(0.48;0.50)	58,368	1.55	(1.45;1.65)
Yes	153,369	1.90	(1.83;1.96)	58,413	12.97	(12.69;13.24)
Benign neoplasm						
Overall[1]	1,451,923	0.80	(0.78;0.81)	116,781	3.93	(3.82;4.04)
Gender						
Female	915,969	0.86	(0.84;0.88)	77,990	3.79	(3.66;3.93)
Male	535,954	0.69	(0.57;0.72)	38,791	4.21	(4.01;4.41)
Age						
< 50	685,545	0.47	(0.58;0.61)	23,304	4.24	(3.98;4.50)
≥ 50	766,378	1.09	(1.06;1.11)	93,477	3.85	(3.73;3.98)
Comorbidity						
No	1,298,554	0.74	(0.73;0.76)	58,368	4.71	(4.54;4.89)
Yes	153,369	1.23	(1.18:1.29)	58,413	3.15	(3.01;3.29)
Fracture						
Overall[1]	1,558,255	0.10	(0.10;0.11)	10,579	3.89	(3.53;4.28)

Table 3: Prevalence of neoplasm, fracture and inflammatory pathology within 180 days from first treatment date divided into courses of treatment with no previous diagnose and previously diagnosed.						
Gender						
Female	984,763	0.13	(0.12;0.14)	9,196	3.96	(3.57;4.38)
Male	573,362	0.05	(0.05;0.06)	1,383	3.47	(2.57;4.58)
Age						
< 50	708,677	0.00[2]	(0.00;0.00)	172	23.25	(0.63;58.47)
≥ 50	849,448	0.18	(0.17;0.19)	10,407	3.92	(3.56;4.31)
Comorbidity						
No	1,350,228	0.08	(0.07;0.08)	6,811	3.83	(3.39;4.32)
Yes	208,027	0.24	(0.22;0.27)	3,768	4.01	(3.40;4.68)
Inflammatory						
Overall[1]	1,563,938	0.05	(0.04;0.05)	N/A[3]		
Gender						
Female	991,140	0.04	(0.03;0.04)	N/A		
Male	572,671	0.06	(0.05;0.07)	N/A		
Age						
< 50	706,530	0.06	(0.05;0.06)	N/A		
≥ 50	857,281	0.04	(0.03;0.04)	N/A		
Comorbidity						
No	1,353,102	0.04	(0.04;0.05)	N/A		
Yes	210,836	0.06	(0.05;0.07)	N/A		

Abbreviations: CI: Confidence Interval.

[1] Malign and benign neoplasm: diagnosed with neoplasm 0−3 years prior date of first contact; fracture: diagnosed with a similar fracture in the period 1/1-2004 until date of first contact.
[2] Rounded to two decimals
[3] N/A: Not applicable as this is a group of chronic patients

Discussion

This is the first study to estimate the prevalence of serious pathology among patients with musculoskeletal conditions treated in primary care physiotherapy. The overall prevalence of serious pathology was 2.30%.The

prevalence of neoplasm was 2.11%, of which 1.13% was malignant neoplasms. The prevalence of cauda equina syndrome, fractures, infections and inflammatory pathology of the spine was 0.01%, 0.13%, 0.01% and 0.06% respectively. When previously diagnosed patients were excluded, the prevalence of malign neoplasm, benign neoplasm, fracture and inflammatory pathology was 0.64%, 0.80%, 0.10% and 0.05% respectively.

Strengths and limitations

A major strength of the study is, that the included cohort represents all patients seen in primary care physiotherapy because of musculoskeletal conditions, thus no bias due to selection was present. However, patients who died or migrated within 180 days from their first physiotherapy contact were excluded. Because the study estimated prevalence of serious (and possibly fatal) pathologies, patients might have died of for example neoplasms which means the estimated prevalence could be underestimated. Also, we have no information of possible diagnose among migrated patients. Nevertheless, taking into account the relatively few patients that were excluded the possible underestimation would probably be small. Also misclassifications of serious pathology could have occurred. Although the NPR is based on ICD-10 diagnoses, which enables transparent categorizations of serious pathology, patients could initially present with a suspected serious pathology, but eventually be diagnosed with another condition. If the initial diagnose is not changed correctly afterwards, there is a risk of misclassifications which would result in an overestimated prevalence. This potential misclassification is however thought to be small. To avoid such misclassifications in the neoplasm category, we could have used the Danish Cancer Registry (DCR) (15). In the DCR only verified diagnoses of cancer (malignant neoplasms) are recorded. However, the DCR does not contain information on benign neoplasms. We chose to include both benign and malign neoplasms, because the signs and symptoms of benign neoplasm are often the same as malignant neoplasm, thereby making the distinction of symptoms very difficult. This possible overestimation would, however, still be based on a suspicion of serious pathology which means the patient should be referred to further evaluation in secondary care. Furthermore, as benign neoplasms also can severely affect the patients' general health status the detection of overall symptoms of neoplasms and timely referral still seems important. If the physiotherapist has even a vague suspicion that the patient might have a serious pathology the physiotherapist should send the patient back to the GP for further investigation.

In the NHSR it is not possible to extract reasons for referrals, meaning we cannot categorize the musculoskeletal conditions into specific diagnose groups. It however seems plausible, that the prevalence of spine specific serious pathologies, such as fractures and cauda equina syndrome, are higher among patients with spine specific conditions. Unfortunately, this hypothesis could not be investigated in the present study.

Interpretation of the results

To our knowledge, this is the first study investigating the prevalence of serious pathology in primary care patients with a wide range of musculoskeletal conditions as compared to spine specific conditions. The neoplasm estimate of 2.11% is the largest contributor to the overall estimate of 2.30%. This indicates that screening for serious pathology in physiotherapy practise perhaps could benefit from concentrating more on screening for neoplasm. Also the results as expected showed, that among previously diagnosed patients, the

prevalence is significantly higher than among those with a first diagnose. We chose to include the previously diagnosed patients in the estimates, as this is very important information for the physiotherapist to consider, when screening patients for serious pathologies. This may be most important for the neoplasm or fracture category, as it could indicate a relapse of disease or the presence of osteoporosis. The overall prevalence of both malign and benign neoplasm was markedly reduced, when only looking at courses of treatment where the patient had not previously been diagnosed with neoplasm. In the fracture category the change was more modest. Prevalence estimates of inflammatory pathology among patients previously diagnosed with a similar pathology was omitted, as this is a group of lifelong chronic diseases making prevalence estimates less useful.

Among patients with LBP it has been acknowledged, that approximately 1% have an undiscovered serious pathology (3,4,16,17). This estimate is however based on relatively old and small studies and more recent evidence suggests that the prevalence of serious pathology among primary care LBP patients may be as high as 6% (18). Unfortunately, previously conducted studies in this field are all challenged by small study populations resulting in inaccurate or missing estimates because few or none of the participants were diagnosed with the specific serious pathologies (6,19). Nevertheless, the results of the present study suggest, that the previously acknowledged estimate may be too low. All the included patients in the present study had been referred by the GP, meaning the GP had screened for serious pathology as a natural part of their consultation. Despite that, 2.3% of the patients were diagnosed with serious pathology within 180 days from their first contact. Although we cannot assume that all of these patients would have had symptoms of serious pathology, it remains certain that the physiotherapists cannot solely rely on the initial screening from the GP, because these serious conditions may cause symptoms that develop over time.

Generalisability of the results

The external validity of the study is considered excellent, as the study was based on Danish national healthcare registries, which covers the total Danish population. Because of the study power and completeness of the Danish healthcare registries, the prevalence of different categories of serious pathologies form a very robust and accurate estimation in the group of patients with musculoskeletal conditions treated in primary care physiotherapy.

Conclusion

The prevalence of serious pathology among musculoskeletal physiotherapy patients was 2.3%. This means, that although serious pathology is rare, it is more frequent than the guideline endorsed prevalence estimates suggests.

Abbreviations

CCI Charlson Comorbidity index

CI Confidence Interval

DCR Danish Cancer Registry

GP General Practitioner

ICD International Classification of Diseases and Related Health Problems

IQR Inter Quartile Range

LBP Low Back Pain

N Number

NHSR National Health Service Register

NPR National Patient Register

RECORD Reporting of studies Conducted using Observational Routinely-collected Data

SD Standard Deviation

STROBE Strengthening the Reporting of Observational Studies in Epidemiology

Declarations

Ethics approval and consent to participate

The study was approved by the Danish Data Protection Agency (No. 1-16-02-41-19). Under Danish law this study did not need ethics approval (Act on Research Ethics Review of Health Research Projects, October 2013) (12).

Consent for publication

N/A

Availability of data and materials

The dataset supporting the conclusions of this article can only be accessed through the Danish Health Data Authority (Sundhedsdatastyrelsen).

Competing interests

The authors declare that they have no competing interests.

Authors' contribution

All the authors planned and designed the study. CRB performed the statistical analyses and drafted the manuscript. All authors contributed in interpretation of the results and critical revision of the manuscript. All authors read and approved the final manuscript.

Author's information

N/A

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