Factors associated with prescribing physiotherapy for adult patients consulting for musculoskeletal disorders in primary care; an ancillary study to ECOGEN

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Abstract

Background: Musculoskeletal disorders (MSD) are multifactorial requiring multidisciplinary treatment including physiotherapy. General practitioners (GP) have a central role in managing MSDs and mostly solicit physiotherapists accounting for 76.1% of physiotherapy prescriptions in France. Patient, physician, and contextual factors, including healthcare accessibility, can influence physiotherapy prescription rates.

Objective: To identify patient, physician, and contextual factors associated with physiotherapy prescription in adult patients with MSDs in general practice.

Methods: This study is based on the 2011/2012 French cross-sectional ECOGEN study. Analyses included working-age patients consulting their GP for any MSD. Physiotherapy prescription was assessed initially, then adjusted multilevel logistic model analysis of patient, physician, geographical area-related factors associated with these prescriptions was performed.

Results: Among the 2305 patients included, 456 (19.8%) were prescribed physiotherapy. Following multilevel multivariate analyses, physiotherapy was prescribed more frequently for female patients (OR 1.28; 95% CI [1.03, 1.59]) with spinal (OR 1.47; 95% CI [1.18, 1.83]) and upper limb disorders (OR 1.66; 95% CI [1.20, 2.29]), and less frequently for patients ≥50 years (OR 0.69; 95% CI [0.52, 0.91]), living in deprived geographical areas (OR 0.60; 95% CI [0.40, 0.90]). GPs prescribed physiotherapy less frequently if they were ≥ 50 years (OR 0.50; 95% CI [0.39, 0.63]), had a high number of annual consultations, or were practicing in semi-urban area in a multidisciplinary team.

Conclusion: This multilevel analysis identifies factors associated with physiotherapy prescription for patients with MSDs, including living in deprived geographical areas. This constitutes an original contribution towards addressing healthcare disparities.

Background

Musculoskeletal disorders (MSDs) affect the musculoskeletal system (i.e. muscles, tendons, ligaments, nerves, discs, cartilage, and joints) and can be caused by injuries such as repetitive strain during work or sport. In France, MSDs account for 50% of occupational accident compensation and 87% of occupational disease compensation (1, 2). Similarly, in European countries, nearly 50% of employees reported MSD symptoms within the past 12 months with the most common being low back pain (LBP) (44%) and upper-limb pain (42%) (3). The economic burden is estimated at 3% of gross domestic product, with 10 million working days lost in France alone and 1 billion euros paid in compensation in 2012 (6, 7). The human burden is also considerable, with LBP being the leading global cause of years lived with disability for both genders in 2017, followed by headache and depression (8, 9).

MSDs are multifactorial in origin involving biomechanical, professional, psychosocial, or work organisation factors, and possibly follow an exposomic model (10, 11). For this reason, treatment is based on a multidisciplinary, holistic approach, including physical activity (and active physiotherapy), medication, surgery, psychotherapy, alternative medicine and, social and administrative procedures including sick leave and worker's compensation (12).

General practitioners (GP) have a central role in managing MSDs. In a 2010 French survey, 77% of patients who had experienced LBP in the previous 2 months had consulted a GP (13). Faced with MSDs, GPs mostly solicit physiotherapists with GP prescriptions accounting for 76.1% of physiotherapy prescriptions in France (13, 14).

Physiotherapy has been shown to reduce pain, disability, opioid use, imaging investigations, medical or surgical consultations, infiltrations, and care-related costs (15–17). For these reasons, European and American guidelines

recommend early physiotherapy (18, 19).

However, GPs have heterogeneous prescribing habits to physiotherapists both within and between European countries (20). Additionally, prescribing a physiotherapist consultation can also impacted by patient, physician and contextual factors including psychosocial mechanisms or healthcare system accessibility (21, 22).

This study aimed to identify patient, GP, and contextual factors associated with physiotherapy prescription among 18 to 65-year-old patients consulting for MSDs in general practice to highlight inequalities in health accessibility and areas for improvement.

Methods

Study design

This is an ancillary study to ECOGEN (Elements of COnsultation in GENeral practice), which is a French national, cross-sectional, observational study conducted by the French College of General Practice Teachers (CNGE) between November 2011 and April 2012. The ECOGEN study design has been previously described (23). Fifty-four trainee GPs collected data during their general practice internship with 128 GPs who were internship supervisors affiliated to 27 French medical schools. The trainees underwent a 2-day centralised data collection training course.

Data collection

The ECOGEN study captured data from all consultations on one day per week. Specifically, patient age, gender, socio-professional category, receipt of compensation (occupational accident or disease), reason for consultation, consultation results (health conditions managed during the consultation) and prescribed healthcare procedures. The verbatim and data were collected on a paper form and coded using the ICPC-2 classification (International Classification of Primary Care, 2nd edition, proposed by the WONCA) according to a hierarchical structure (24) enabling consultation results and healthcare procedures to be classified by body system. They were then entered into a centralised online database. Double data collection was performed on one day to ensure reproducibility and minimise error for each investigator.

A consultation could produce one or several consultation results, and each consultation result can lead to one or several healthcare procedures defined as a clinical examination, imaging, laboratory assessment, prescription for medication or sick-leave, referral to another physician or allied health professional, advice, or recommendations.

Contextual variable aggregation

GP and physiotherapist accessibility was estimated using a geographical “catchment area” that included several towns where at least 16 out of the 31 social and health facilities were available (25). These facilities included educational and health services, personal services such as hairdressers, retail/sports/culture/leisure facilities and transport infrastructure. Off-peak travel time was used to assess patient proximity to these social and health facilities, and geographical areas were then determined using an iterative aggregation method developed by the French national institute of statistics and economic studies (INSEE) (25).

The two calculated contextual variables relating to the *catchment area* were GP and physiotherapist accessibility and the French deprivation index (FDep) based on the patient postcode. Data were available at town level (26), and were aggregated at geographical catchment level using a weighted mean.

a) *GP and physiotherapist accessibility.* Health system decision-makers use healthcare professional accessibility as an accessibility indicator, known as potential localised accessibility (PLA), which is calculated using an iterative

aggregation method (25). A PLA of 1 equates to a full-time GP practicing in a location 15 minutes away from the patient.

b) *French deprivation index.* The French Deprivation index, proposed by Rey et al. in 2009 (27), was used to assess social inequalities at a geographical level. This index is based on a Principal Component Analysis associating median incomes and the proportion of the population who are employed, unemployed and have a secondary education diploma. The score increases with the deprivation markers.

Inclusion criteria

The analyses included working-aged patients aged from 18 to 65 years with a consultation result coded for one of the MSD codes. These MSD codes were selected from the Locomotor "L" category including conditions resulting from overuse of the musculoskeletal system (Additional file 1). Infectious, inflammatory, traumatic, and neoplastic codes were not included.

Analyses

MSD consultations were identified and characteristics for patients with and without physiotherapy prescription were compared, for age, gender, profession, compensation for an occupational accident or disease, mean consultation duration, time of day, and healthcare procedures (laboratory assessment, imaging, infiltration, medication, sick leave prescription, advice). Quantitative independent patient variables were compared using Student's t-test, or a non-parametric Mann-Whitney U test in case of variance inequality. Qualitative variables were described using frequencies and percentages and compared using the Chi-squared test or Fisher's exact test for small numbers ($n < 5$).

Physiotherapy prescription probability was modelled according to a marginal adjusted logistic model based on Generalised Estimating Equations (GEE) with an exchangeable variance-covariance matrix, due to the hierarchical data structure and the population-average approach (28, 29). Sensitivity analyses were performed last to compare our marginal model with both a random intercept model and a fixed slope mixed model on physician and geographical area variables.

We identified relevant clinical variables and potential confounders using a Directed Acyclic Graph (DAG) based on the literature findings (Additional file 2).

Marginal and mixed univariate analyses were performed for all the variables identified by the DAG, with a statistical α threshold of 0.20. An adjusted multilevel analysis was then performed with the univariate variables retained, with a statistical α threshold of 0.05. Interactions between patient age and spine or rotator cuff tendinitis symptoms, and between the FDep and these symptoms were also tested in the multivariate analyses. Statistical analyses were performed using R software, version 1.1.463, and the packages joineR, dplyr, stringr, car, FactoMineR, factoextra, lme4, survival, ICC, geepack, gee.

Ethical considerations

The ECOGEN study was approved by an ethics committee (CPP Sud-Est L11-149, 10/11/2011) and included consent for ancillary studies on the ECOGEN database. A poster in the waiting room informed patients about the study and the GP collected verbal consent at the beginning of the consultation.

Results

Description

Among the 11196 patients aged from 18 to 65 years, 2305 (20.6%) consulted for an MSD symptom (Fig. 1).

The most frequent MSD symptoms for these 2305 patients were LBP (31.4%), shoulder pain (10.3%) and cervical pain (7.9%) (Additional file 3). Of these patients, 6.9% presented multi-site pain, 12.6% muscular pain and 11.0% arthrosis. Overall, spinal symptoms made up 44.9% of all MSD symptoms, upper limb 16.7% and lower limb 9.8%.

Among the 2305 MSD patients, 456 (19.8%) were prescribed physiotherapy. Patients referred for physiotherapy were more frequently women (p = 0.024) aged under 50 years (p = 0.03), compared with those who were not referred. There was no statistical difference between physiotherapy prescription for MSD and profession or consultation duration (Table 1). The MSD sites with the highest physiotherapy prescription rates were cervical (28.9%), shoulder (25.7%), back (23.7%), lumbar (22.4%) and elbow (22.5%).

Table 1
– Characteristics of 2305 patients consulting for musculoskeletal disorders according to physiotherapy prescription status.

	Total population with MSD symptoms (%)	**Physiotherapy prescription (%)**	**No physiotherapy prescription (%)**	**p-value**
Patient variables	**N = 2305**	**N = 456**	**N = 1849**	
Age				**0.003**
< 35 years	439 (19.0)	110 (24.1)	329 (17.8)	
35–50 years	755 (32.8)	152 (33.3)	603 (32.6)	
> 50 years	1111 (48.2)	194 (42.6)	917 (49.6)	
Gender: Female (%)	1382 (60.0)	295 (64.7)	1087 (58.8)	**0.024**
Profession (%)				**0.049**
Farmer	17 (0.7)	2 (0.4)	15 (0.8)	
Self-employed	129 (5.6)	24 (5.3)	105 (5.7)	
Managerial staff	169 (7.3)	28 (6.1)	141 (7.6)	
Intermediate-level profession	201 (8.7)	56 (12.3)	145 (7.8)	
Salaried worker	898 (39.0)	183 (40.1)	715 (38.7)	
Manual worker	241 (10.5)	49 (10.7)	192 (10.4)	
Retired	302 (13.1)	46 (10.1)	256 (13.8)	
Unemployed	348 (15.1)	68 (14.9)	280 (15.1)	
Compensation for an occupational accident or disease (%)	247 (10.7)	50 (11.0)	197 (10.7)	0.914
Consultation duration: mean (standard deviation)	18.23 (11.69)	18.13 (7.94)	18.25 (12.45)	0.800
MSD: Musculoskeletal disorder				

Medication (64.5%), physiotherapy (19.8%), imaging (17.1%) and sick leave (16.9%) were most frequently prescribed for MSD while laboratory investigations and infiltrations were scarce (Table 2). Physiotherapy prescription frequencies decreased with the number of other associated healthcare procedures (p < 0.001).

Table 2
– Healthcare procedures associated with consultation for musculoskeletal disorder symptoms in 2305 patients.

	Total population with MSD symptoms (%) n = 2305	Physiotherapy prescription (%) n = 456	No physiotherapy prescription (%) n = 1849	p-value
Number of healthcare procedures associated with an MSD symptom per patient				**< 0.001**
1–3	846 (36.7)	274 (60.1)	572 (30.9)	
4–6	976 (42.3)	128 (28.1)	848 (45.9)	
> 6	483 (21.0)	54 (11.8)	429 (23.2)	
Healthcare procedures				
Medication	1486 (64.5)	262 (57.5)	1224 (66.2)	**< 0.001**
Imaging	394 (17.1)	56 (12.3)	338 (18.3)	**0.002**
Sick leave	390 (16.9)	73 (16.0)	317 (17.1)	0.562
Advice and recommendations	224 (9.7)	56 (12.3)	168 (9.1)	0.039
Laboratory investigation	62 (2.7)	3 (0.7)	59 (3.2)	**0.001**
Infiltration	51 (2.2)	3 (0.7)	48 (2.6)	**0.008**

MSD: Musculoskeletal disorder

Hierarchical model for patients consulting for an MSD

Table 3 presents the results for the GEE models. Patients were more likely to be prescribed physiotherapy if they were women and if they presented a spinal or upper limb symptom. However, physiotherapy prescription was less likely if the patient was aged over 50 years, lived in an area with a high FDep, or had four or more associated healthcare procedures. GPs were less likely to prescribe physiotherapy if they were over 50 years old, practicing in a semi-urban area or in a multidisciplinary team or had a high annual number of consultations (over 5000/year).

Table 3
– Associations determined using an adjusted logistical GEE model.

Variable	Model considering all MSD location (n = 2305) OR (CI 95%)	p-value	Model considering only spinal location (n = 906) OR (CI 95%)	p-value	Model considering only shoulder location (n = 255) OR (CI 95%)	p-value
Patient variables						
Patient age	1	0.084	1	0.096	1	0.056
18–34 years	0.78 (0.58–1.04)	**0.008**	0.78 (0.59–1.05)	**0.033**	0.75 (0.56–1.01)	**0.003**
35–50 years	0.69 (0.52–0.91)		0.74 (0.56–0.98)		0.65 (0.49–0.86)	
50–65 years						
Gender female	1.28 (1.03–1.59)	**0.024**	1.30 (1.05–1.62)	**0.011**	1.29 (1.04–1.60)	**0.020**
Number of associated healthcare procedures	1	**0.013**	1	**0.016**	1	**0.014**
0–3	0.73 (0.57–0.93)	**0.018**	0.73 (0.57–0.93)	**0.027**	0.73 (0.57–0.94)	**0.022**
4–6	0.68 (0.50–0.94)		0.70 (0.51–0.96)		0.69 (0.50–0.95)	
> 6						
GP variables						
GP age > 50 years	0.50 (0.39–0.63)	**< 0.001**	0.50 (0.40–0.63)	**< 0.001**	0.50 (0.39–0.63)	**< 0.001**
Practice location	1	**0.013**	1	**0.018**	1	**0.011**
Rural	0.62 (0.42–0.90)	0.344	0.62 (0.43–0.91)	0.325	0.61 (0.42–0.90)	0.319
Semi-urban	0.84 (0.58–1.21)		0.85 (0.59–1.23)		0.83 (0.57–1.20)	
Urban						
Type of practice	1	0.902	1	0.806	1	0.924
Alone	0.98 (0.74–1.30)	**0.011**	0.98 (0.74–1.30)	**0.009**	0.99 (0.74–1.31)	**0.014**
Group	0.62 (0.43–0.90)		0.62 (0.43–0.90)		0.63 (0.43–0.91)	
Multidisciplinary team						
Number of consultations per year	0.79 (0.63–0.99)	**0.038**	0.80 (0.64-1.00)	0.052	0.78 (0.62–0.98)	**0.032**
> 5000						

Associations between physiotherapy prescription for musculoskeletal disorders, patient and GP characteristics and contextual characteristics according to an adjusted logistical GEE model.

MSD: musculoskeletal disorder; OR: Odds ratio; FDep: French Deprivation index; Q1: 1st quartile, Q2: 2nd quartile, Q3: 3rd quartile, Q4: 4th quartile (deprivation gradient from the least to the most deprived area).

Variable	Model considering all MSD location (n = 2305) OR (CI 95%)	p-value	Model considering only spinal location (n = 906) OR (CI 95%)	p-value	Model considering only shoulder location (n = 255) OR (CI 95%)	p-value
Geographical variables						
FDep	1	0.053	1	0.079	1	0.054
Q1	0.73 (0.52-1.00)	**0.013**	0.74 (0.53–1.02)	**0.011**	0.73 (0.52–1.01)	**0.011**
Q2	0.61 (0.41–0.90)	**0.013**	0.62 (0.42–0.92)	**0.009**	0.60 (0.40–0.89)	**0.012**
Q3	0.60 (0.40–0.90)		0.61 (0.40–0.91)		0.59 (0.39–0.89)	
Q4						
Spine symptoms (versus any other)	1.47 (1.18–1.83)	**< 0.001**	-	**-**	-	-
Shoulder symptoms (versus any other)	1.66 (1.20–2.29)	**0.002**	-	-	-	**-**

Associations between physiotherapy prescription for musculoskeletal disorders, patient and GP characteristics and contextual characteristics according to an adjusted logistical GEE model.

MSD: musculoskeletal disorder; OR: Odds ratio; FDep: French Deprivation index; Q1: 1st quartile, Q2: 2nd quartile, Q3: 3rd quartile, Q4: 4th quartile (deprivation gradient from the least to the most deprived area).

Furthermore, multivariate analyses identified similar associations when analyses were restricted to the spinal diagnosis. However, there was a negative association between physiotherapist accessibility and physiotherapy prescription (Additional file 4). In contrast, no associations were observed between the selected factors and shoulder symptoms (Additional file 5).

Sensitivity analyses with mixed effect models found similar results (Additional file 6 and 7).

Discussion

Main findings

In the present study, one in five (19.8%) patients consulting a French GP for MSD symptoms were prescribed physiotherapy. Physiotherapy prescription was directly associated with a combination of factors related to the patient, the GP, and territorial characteristics. Specifically, younger, female patients were more likely to have a physiotherapy

prescription, whereas, physiotherapy prescription was less likely with older physician age, semi-urban practice location, multidisciplinary practice, older patients, larger numbers of healthcare procedures and increased deprivation.

Comparison with existing literature

Few other studies examining physiotherapy prescription are available. The existing literature has already suggested these patient characteristics among patients with chronic LBP or MSD (30, 31) while few studies have explored the impact of GP and contextual characteristics. Long consultation duration, the existence of compensation for occupational disease or accident, and physicians practicing in a rural area are other factors shown to be associated with increased physiotherapy prescription in the literature and in our study (32–34). These studies also reported an association between physiotherapy prescriptions and socio-economic factors including private health insurance, or pain management with co-prescription of non-steroidal anti-inflammatory drugs and muscle relaxants.

In our study, MSD management varies between consultations with and without physiotherapy prescription. When physiotherapy was prescribed, there were significantly fewer prescriptions for laboratory and imaging investigations and medication. The healthcare procedures associated with MSD seem to suggest there are two distinct approaches to managing MSD based on the underlying diagnosis: either a functional approach in which physiotherapy is prescribed but no further diagnostic exploration is required, or a biomedical approach with laboratory or imaging investigations, more medication and corticosteroid infiltrations. This biomedical approach could be explained by the uncertainty of the MSD diagnosis, the presence of disease complications or a patient's specific pathology (35, 36). Notably, the number of healthcare procedures could be associated with MSD management, or with the patient's comorbidities.

Strengths and limitations

The ECOGEN study is a French national, multicentre, observational study which included 20613 patients in a primary care setting. The response rate was very high (99.2%), and missing data and coding error rates were very low (1.5%). This is one of the first French primary care observational studies to explore the hierarchical context of consultations (reason for consultation, consultation results and healthcare procedures) using the ICPC-2, and to our knowledge is the widest one to date. We therefore believe that the ECOGEN data remain highly valuable despite their age. Previous analyses based on this study did not reveal sociodemographic differences between ECOGEN physicians and French physicians nationally (23). However, GP internship supervisors have been described as having particular prescription characteristics, such as prescribing more preventive treatments (37). It could also be hypothesised that they follow recommendations and guidelines more closely.

Our study explored original variables in the primary care and public health context, using geographical variables (physiotherapist and GP accessibility, neighbourhood deprivation index) in a multilevel marginal approach. Sensitivity analyses comparing marginal, random and fixed effect models enhanced the robustness of the results and the internal validity of our study.

The ICPC-2 is suboptimal for MSD-related diagnoses, as it is less precise than other classifications, such as ICD 10 or DSM 4, but it was developed for the primary care context where diagnosis is often uncertain and consultation duration short (24). In addition, this study is only representative of the French system, which has its own specificities in terms of prescription, MSD management, and cultural and economic factors.

These ECOGEN results reflect the French primary care and health system setting, where 76% of physiotherapy prescriptions are from GPs. In France, as in other countries, physiotherapy prescription can be initiated by physiotherapists themselves or through self-referral. Self-referral is associated with lower healthcare costs and reduces consultation pressure on GPs (38). Young patients with spine or shoulder pain in a sports or leisure context are most

likely to self-refer (39). Physiotherapy triage by a nurse in primary care setting has also been associated with lower healthcare costs, less pain and disability, reduced risk of chronicity and improved quality of life (40).

Finally, due to the cross-sectional data collection design, conclusions on causality are limited compared to a cohort study.

Perspectives

Performing meta-epidemiological analyses of routine data, such as national health insurance and shared medical file data, could increase the power or representativeness of studies and provide more precise data on healthcare utilisation and pathways. Results from these studies could help reduce social health inequalities by facilitating development of interventions adapted to contextual needs which consider patient literacy, living environment and accessibility to health services in its geographical, temporal, socioeconomic and cultural dimensions.

Conclusion

Our study highlights the association between GP and contextual factors on physiotherapy prescription rates for patients consulting for MSD. These findings suggest territorial healthcare disparities that should be considered in a health inequality reduction approach. Holistic approaches including patient, GP and contextual variables are particularly relevant and suited to the primary care setting and should be extended to other healthcare professionals or particular contextual issues.

Abbreviations

MSD
Musculoskeletal Disorders
LBP
Low Back Pain
GP
General Practitioner
ECOGEN
Elements of COnsultation in GENeral practice
CNGE
French College of General Practice Teachers
ICPC
International Classification of Primary Care
WONCA
World Organisation of Family Doctors
INSEE
French National Institute of Statistics and Economic Studies
FDep
French Deprivation Index
PLA
Potential Localised Accessibility
GEE
Generalised Estimating Equations
DAG

Direct Acyclic Graph
ICD
International Classification of Diseases
DSM
Diagnostic and Statistical Manual of Mental Disorders

Declarations

Ethics approval and consent to participate

The ECOGEN study and patient's informed consent modalities were approved by an ethics committee (French Committee for the protection of persons CPP Sud-Est L11-149, 10/11/2011) and included consent for ancillary studies on the ECOGEN database. Written consent was not collected due to the observational design on routine consultation data. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from Laurent Letrilliart but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Laurent Letrilliart.

Competing interests

None.

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Author's contributions

MP, YR and ARR agreed on study objectives and protocol. MP, MB, NF and ARR recoded and

analysed data. MP, MB, NF, NA, YR and ARR interpreted and discussed results. MP, NA and ARR

wrote the initial version of the manuscript. All authors read and approved the final manuscript.

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References

1. INRS. Risques liés à l'activité physique [Internet]. 2016. Available at:
2. Fouquet N, Bodin J, Chazelle E, Descatha A, Roquelaure Y. Use of Multiple Data Sources for Surveillance of Work-Related Chronic Low-Back Pain and Disc-Related Sciatica in a French Region. Ann Work Expo Health. 28 May 2018;62(5):530–46.
3. Eurofound (2017). Sixth European working conditions survey - Overview report (2017 update). Publication office of the European union; 2017.
4. AMELI. Comprendre les troubles musculo-squelettiques [Internet]. 2017. Available at: https://www.ameli.fr/assure/sante/themes/tms/comprendre-troubles-musculosquelettiques
5. Roquelaure Y. Les troubles musculo-squelettiques: un enjeu majeur de prévention des risques professionnels en Europe [Internet]. European trade union institute; 2015 [cited 25 July 2019]. Available at: https://www.etui.org/fr/Publications2/Policy-Briefs/European-Economic-Employment-and-Social-Policy/Les-troubles-musculo-squelettiques-un-enjeu-majeur-de-prevention-des-risques-professionnels-en-Europe
6. Roquelaure Y. Les troubles musculo-squelettiques: un enjeu majeur de prévention des risques professionnels en Europe [Internet]. European trade union institute; 2015 [cited 25 July 2019]. Available at: https://www.etui.org/fr/Publications2/Policy-Briefs/European-Economic-Employment-and-Social-Policy/Les-troubles-musculo-squelettiques-un-enjeu-majeur-de-prevention-des-risques-professionnels-en-Europe
7. INRS. Troubles musculo-squelettiques [Internet]. 2017. Available at:
8. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. nov 2018;392(10159):1789–858.
9. Husky MM, Ferdous Farin F, Compagnone P, Fermanian C, Kovess-Masfety V. Chronic back pain and its association with quality of life in a large French population survey. Health Qual Life Outcomes. 26 Sept 2018;16(1):195.
10. Paganelli M, De Palma G, Apostoli P. [Exposome: from an intuition to a mandatory research field in occupational and enviromental medicine.]. G Ital Med Lav Ergon. 2017;39(2):68–71.
11. Kim KN, Hong YC. The exposome and the future of epidemiology: a vision and prospect. Environ Health Toxicol. 2017;32:e2017009.
12. Bouton C, Bègue C, Petit A, Fouquet N, Py T, Huez JF, et al. Prendre en charge un patient ayant une lombalgie commune en médecine générale. Exercer. 2018;(139):28–37.
13. Plénet A, Gourmelen J, Chastang JF, Ozguler A, Lanoë JL, Leclerc A. Seeking care for lower back pain in the French population aged from 30 to 69: the results of the 2002–2003 Décennale Santé survey. Ann Phys Rehabil Med. May 2010;53(4):224–31, 231–8.
14. IRDES. Données de cadrage: Démographie et activité des professions de santé [Internet]. 2013 [cité 25 juill 2019]. Available at: https://www.irdes.fr/EspaceEnseignement/ChiffresGraphiques/Cadrage/DemographieProfSante/Prescriptions.htm
15. Thackeray A, Hess R, Dorius J, Brodke D, Fritz J. Relationship of Opioid Prescriptions to Physical Therapy Referral and Participation for Medicaid Patients with New-Onset Low Back Pain. J Am Board Fam Med JABFM. Dec 2017;30(6):784–94.
16. Fritz JM, Cleland JA, Speckman M, Brennan GP, Hunter SJ. Physical therapy for acute low back pain: associations with subsequent healthcare costs. Spine. 15 July 2008;33(16):1800–5.

17. Fritz JM, Childs JD, Wainner RS, Flynn TW. Primary care referral of patients with low back pain to physical therapy: impact on future health care utilization and costs. Spine. 1 Dec 2012;37(25):2114–21.
18. Zheng P, Kao MC, Karayannis NV, Smuck M. Stagnant Physical Therapy Referral Rates Alongside Rising Opioid Prescription Rates in Patients With Low Back Pain in the United States 1997–2010. Spine. 1 May 2017;42(9):670–4.
19. Hanney WJ, Masaracchio M, Liu X, Kolber MJ. The Influence of Physical Therapy Guideline Adherence on Healthcare Utilization and Costs among Patients with Low Back Pain: A Systematic Review of the Literature. PloS One. 2016;11(6):e0156799.
20. Wiitavaara B, Fahlström M, Djupsjöbacka M. Prevalence, diagnostics and management of musculoskeletal disorders in primary health care in Sweden - an investigation of 2000 randomly selected patient records. J Eval Clin Pract. April 2017;23(2):325–32.
21. Ramond A, Bouton C, Richard I, Roquelaure Y, Baufreton C, Legrand E, et al. Psychosocial risk factors for chronic low back pain in primary care–a systematic review. Fam Pract. Feb 2011;28(1):12–21.
22. Bollen A, Harrison R, Aslani P, van Haastregt JCM. Factors influencing interprofessional collaboration between community pharmacists and general practitioners-A systematic review. Health Soc Care Community. July 2019;27(4):e189–212.
23. Letrilliart L, Supper I, Schuers M, Darmon D, Boulet P, Favre M, et al. ECOGEN: étude des Éléments de la COnsultation en médecine GENérale. Exercer. April 2014;(114):148–57.
24. Classification Committee of WONCA. ICPC-2. International Classification of Primary Care. Oxford: Oxford University Press; 1998.
25. Barlet, Coldefy, Collin, Lucas-Gabrielli. L'accessibilité potentielle localisée (APL): une nouvelle mesure de l'accessibilité aux médecins généralistes libéraux - Ministère des Solidarités et de la Santé [Internet]. DREES; 2012 [cité 25 juill 2019]. Available at: https://drees.solidarites-sante.gouv.fr/etudes-et-statistiques/publications/etudes-et-resultats/article/l-accessibilite-potentielle-localisee-apl-une-nouvelle-mesure-de-l
26. Direction de la Recherche, des Etudes, de l'Evaluation et des Statistiques (DREES). Accessibilité Potentielle Localisée (APL) aux masseurs-kinésithérapeutes libéraux [Internet]. [cited 26 Aug 2019]. Disponible sur: http://www.data.drees.sante.gouv.fr/TableViewer/tableView.aspx?ReportId=2951
27. Rey G, Rican S, Jougla E. Mesure des inégalités de mortalité par cause de décès - Approche écologique à l'aide d'un indice de désavantage social. BEH. 2011;(8–9):87–90.
28. Hubbard AE, Ahern J, Fleischer NL, Van der Laan M, Lippman SA, Jewell N, et al. To GEE or not to GEE: comparing population average and mixed models for estimating the associations between neighborhood risk factors and health. Epidemiol Camb Mass. July 2010;21(4):467–74.
29. Subramanian SV, O'Malley AJ. Modeling Neighborhood Effects. Epidemiol Camb Mass. July 2010;21(4):475–81.
30. Ramond-Roquin A, Pecquenard F, Schers H, Van Weel C, Oskam S, Van Boven K. Psychosocial, musculoskeletal and somatoform comorbidity in patients with chronic low back pain: original results from the Dutch Transition Project. Fam Pract. June 2015;32(3):297–304.
31. Truchon M, Fillion L. Biopsychosocial Determinants of Chronic Disability and Low-Back Pain: A Review. J Occup Rehabil. 1 June 2000;10(2):117–42.
32. Thackeray A, Hess R, Dorius J, Brodke D, Fritz J. Relationship of Opioid Prescriptions to Physical Therapy Referral and Participation for Medicaid Patients with New-Onset Low Back Pain. J Am Board Fam Med JABFM. Dec 2017;30(6):784–94.
33. Freburger JK, Holmes GM, Carey TS. Physician referrals to physical therapy for the treatment of musculoskeletal conditions. Arch Phys Med Rehabil. Dec 2003;84(12):1839–49.

34. Feleus A, Bierma-Zeinstra SMA, Bernsen RMD, Miedema HS, Verhaar JAN, Koes BW. Management decisions in nontraumatic complaints of arm, neck, and shoulder in general practice. Ann Fam Med. Oct 2009;7(5):446–54.
35. Fritz JM, Brennan GP, Hunter SJ, Magel JS. Initial management decisions after a new consultation for low back pain: implications of the usage of physical therapy for subsequent health care costs and utilization. Arch Phys Med Rehabil. May 2013;94(5):808–16.
36. Feleus A, Bierma-Zeinstra SMA, Miedema HS, Verhaar JAN, Koes BW. Management in non-traumatic arm, neck and shoulder complaints: differences between diagnostic groups. Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc. Sept 2008;17(9):1218–29.
37. Delpech R, Noël F. Caractéristiques sociodémographiques et pratiques préventives des médecins généralistes: être maître de stage des universités les modifient-elles ? Exercer. sept 2019;(155):300–5.
38. Downie F, McRitchie C, Monteith W, Turner H. Physiotherapist as an alternative to a GP for musculoskeletal conditions: a 2-year service evaluation of UK primary care data. Br J Gen Pract J R Coll Gen Pract. May 2019;69(682):e314–20.
39. Kooijman M, Swinkels I, van Dijk C, de Bakker D, Veenhof C. Patients with shoulder syndromes in general and physiotherapy practice: an observational study. BMC Musculoskelet Disord. 8 April 2013;14:128.
40. Bornhöft L, Larsson ME, Nordeman L, Eggertsen R, Thorn J. Health effects of direct triaging to physiotherapists in primary care for patients with musculoskeletal disorders: a pragmatic randomized controlled trial. Ther Adv Musculoskelet Dis. 2019;11:1759720X19827504.

Figures

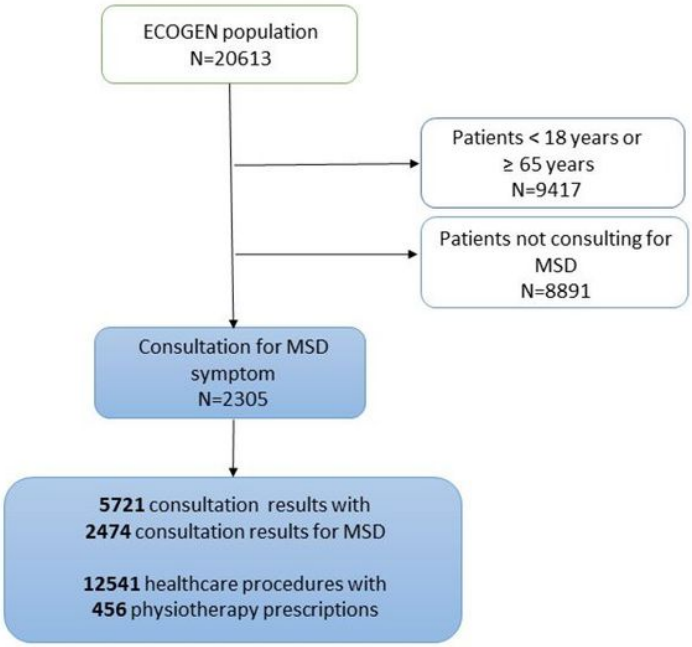

Figure 1

Flow chart showing inclusion of 2305 patients with musculoskeletal symptoms

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