

The approach of physiatrists to low back pain across Europe

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Abstract.

BACKGROUND: Low back pain (LBP) is the most common type of musculoskeletal pain, thus it is one of the most commonly encountered conditions in Physical and Rehabilitation Medicine. The physicians who are primarily responsible for the nonsurgical management of LBP are physiatrists.

OBJECTIVE: The present study aimed to investigate the approaches of physiatrists to low back pain across Europe. Preferences, tendencies, and priorities in the diagnosis, management, and treatment of LBP, as well as the epidemiological data pertaining to LBP in PRM practice were evaluated in this Europe-wide study.

METHODS: The study was conducted under the control of the European Society of Physical and Rehabilitation Medicine (ES-PRM) Musculoskeletal Disorders Research Committee. A total of 576 physiatrists from most European countries participated in the survey.

RESULTS: The results show that physiatrists frequently deal with patients with LBP in their daily practice. Most patients are not referred to other departments and are treated with various conservative methods. Less than one-fifth of patients are primarily referred for surgery. The physiatrists believe that a clear diagnosis to account for cases of low back pain is rarely established. The most common diagnosis is discopathy. History and physical examination remain the most valuable clinical evaluation tools for low back pain according to physiatrists. Less than half the patients require a magnetic resonance imaging. Non-steroidal anti-inflammatory drugs are the most commonly prescribed drugs for low back pain. Exercise, back care information, and physical therapy are the preferred conservative treatments. More than half of the physiatrists offer interventional treatments to patients with low back pain.

CONCLUSION: The present study is a preliminary report that presents the attitudes of European physiatrists in the management of low back pain. Further researches are warranted to standardize the conservative management of LBP.

Keywords: Low back pain, physiatrist, conservative management, rehabilitation

1. Introduction

Low back pain (LBP) is the most common type of musculoskeletal pain [1], thus it is one of the most commonly encountered conditions in Physical and Rehabilitation Medicine (PRM). Most people experience LBP at some point in life; the lifetime prevalence varies between 50% and 85% in epidemiological studies [2] and the annual prevalence is estimated at around 40% [3]. The Global Burden of Disease study reported that LBP is the highest ranked condition contributing to years lived with disability [4,5]. It is therefore a significant cause of disability and absence from work.

The physicians who are primarily responsible for the nonsurgical management of LBP are physiatrists. PRM is the specialism that deals with most stages in the management of LBP including the initial evaluation, differential diagnosis, planning appropriate nonsurgical treatments among the many options (patient

education, exercise, physical modalities, drugs, interventional pain procedures, etc.), follow-up, and referral for surgical treatment if necessary. The present study aimed to investigate the approaches of physiatrists to low back pain across Europe. Preferences, tendencies, and priorities in the diagnosis, management, and treatment of LBP, as well as the epidemiological data pertaining to LBP in PRM practice were evaluated in this Europe-wide study.

2. Methods

2.1. Study design and participants

A cross-sectional descriptive survey was undertaken to define the clinical approach of European physiatrists to LBP. A total of 576 physiatrists from most European countries participated in the survey. The survey was

carried out between October 2014 and October 2015. The study was conducted under the control of the European Society of Physical and Rehabilitation Medicine (ESPRM) Musculoskeletal Disorders Research Committee.

2.2. Procedures

An internet based-survey was prepared, and physiatrists from most European countries were invited to participate. National supervisors oversaw the distribution of the survey to physiatrists in their own country. Each national supervisor translated the survey to his or her own native language. The survey document was available to participants in both English and the native language. The survey was largely distributed via an online survey site (Survey Monkey®). Any participant who could not access the online survey site was asked to complete a digital survey document. The responses in the digital survey documents were collected by email. The national supervisors submitted manually the data in the digital survey documents to the online survey site instead of the participants who could not access the online survey site. All the responses were collected from the online survey site.

2.3. The survey

The survey included 22 multiple choices questions and took no more than 3 min to complete to ensure adherence. The questions were prepared by a group of senior physiatrists who each have at least 30 years of experience in PRM. The first part of the survey consisted of 6 questions related to the demographic characteristics of the participants including age, gender, job experience, academic degree, institution, and working area. The second part incorporated 15 questions relating to preferences for the assessment, management, and treatment of LBP. Participants were asked about the number of patients with LBP seen per week, the established causes of LBP, preferred diagnostic methods, the rates and reasons for referral to another clinical department, the preferred treatment options including pharmacological, patient education, physical modalities, exercise, interventional procedures, and the scales [6–10] on LBP which were used most frequently was questioned. The number of structured choices varied according to the nature of the question. Some of the questions were open-ended.

2.4. Statistical analysis

Data analysis was performed with SPSS for Win-

Table 1
Participants' demographics

	Participants (n = 576)
Sex	
Male	211 (36.6%)
Female	365 (63.4%)
Age	
20–30 years	59 (10.2%)
31–40 years	179 (31.2%)
41–50 years	169 (29.3%)
51–60 years	128 (22.2%)
> 60 years	41 (7.1%)
PRM experience	
≤ 5 years	123 (21.4%)
6–10 years	107 (18.5%)
10–20 years	185 (32.2%)
> 20 years	161 (27.9%)
Academic degree	
Resident/specialist registrar	91 (15.8%)
Specialist/consultant	364 (63.2%)
Assistant professor	28 (4.8%)
Associate professor	45 (7.8%)
Professor	48 (8.4%)
Institution	
Tertiary center (university or training hospital)	282 (48.9%)
Secondary center (state hospital)	175 (30.4%)
Primary care	33 (5.8%)
Private practice	86 (14.9%)
Population of the city worked in	
> 1000000	236 (40.9%)
> 500000–1000000	208 (36.1%)
Countryside (< 500000)	132 (23.0%)

PRM, physical and rehabilitation medicine.

SPSS, version 15.0 (SPSS Inc., Chicago, IL, USA). The data was treated in a descriptive and inferential manner. The categorical variables were presented as absolute values and percentages, and the numeric variables as means and standard deviations. The significance level was $p < 0.05$.

3. Results

3.1. Demographic data of the participants

A total of 576 physiatrists participated in the survey. Approximately 60% of the participants were over 40 years old and had specialist PRM experience of more than 10 years. Most of the participants were PRM specialists or consultants. One-fifth of the participants had a university academic degree. Half of the participants worked at a tertiary center. The demographic characteristics of the participants are given in Table 1.

3.2. Assessment and management of the LBP

Table 2 shows the rates of the responses to the

	Participants (n = 576)
Number of patients with LBP seen on average per week	
< 5 patients	56 (9.8%)
6–10 patients	107 (18.5%)
11–15 patients	111 (19.3%)
16–20 patients	85 (14.7%)
> 20 patients	216 (37.6%)
Percentage of patients with LBP given a clear diagnosis	
< 20%	56 (9.9%)
20–39%	90 (15.8%)
40–59%	167 (29.3%)
60–79%	175 (30.8%)
> 80%	81 (14.2%)
Most valuable diagnostic tools in clinical assessment of LBP	
History	494 (86.1%)
Physical examination	556 (96.8%)
Blood tests	46 (8.1%)
X-ray	226 (39.3%)
MRI	271 (47.2%)
Electrodiagnostic tests	65 (11.3%)
Most commonly used or familiarity with LBP scales	
Low Back Pain Rating Scale	91 (16.0%)
Oswestry Disability Index	206 (36.2%)
Progressive Isoinertial Lifting Evaluation	0 (0.0%)
Quebec Back Pain Disability Scale	27 (4.75%)
Rolland-Morris Disability questionnaire	57 (10.0%)
None	188 (33.0%)
Information relied on when treating a patient with LBP	
International evidence-based medicine guidelines	87 (15.8%)
Traditional clinical practice	51 (8.9%)
Both	435 (75.9%)
Percentage of referrals to another clinical department	
< 20%	454 (80.2%)
20–39%	83 (14.6%)
40–59%	19 (3.3%)
60–79%	8 (1.43%)
> 80%	2 (0.3%)
Percentage of patients with LBP treated as inpatients	
< 20%	409 (72.5%)
20–39%	71 (12.6%)
40–59%	41 (7.3%)
60–79%	20 (3.5%)
> 80%	23 (4.1%)
Percentage of referrals for surgical treatment	
< 20%	542 (95.2%)
20–39%	25 (4.4%)
40–59%	2 (0.3%)
60–79%	0 (0.0%)
> 80%	0 (0.0%)

LBP, low back pain; MRI, magnetic resonance imaging.

questions in this survey. Half of the physiatrists involved in the study reported they are responsible for the management of at least 15 patients with LBP per week. Less than 15% of physiatrists were able to establish a clear diagnosis and cause of LBP for at least 80% of their patients. The most common pathologies in patients with LBP are lumbar disc herniation, in-

tervertebral disc disease, spondylosis including facet degeneration, non-specific soft tissues injuries, spinal stenosis, and spondyloarthritis, in order of frequency (Fig. 1). History and physical examination remain the most valuable tools for the clinical assessment of LBP according to the participants. Among the LBP measurement scales, the physiatrists involved in the study were most familiar with the Oswestry Disability Index, the Low Back Pain Rating Scale, and the Rolland-Morris Disability Questionnaire, in order of popularity. Eighty percent of the participants did not request an MRI for more than half of their patients with LBP. Three-quarters of the physiatrists relied on both evidence-based guidelines and traditional clinical practice. Among the participants, 80% referred fewer than 20% of the patients with LBP to another clinical department. Patients were most often referred to neurosurgical departments, followed orthopedics, algology-pain medicine, neurological and rheumatological departments, in order of frequency (Fig. 2).

3.3. Treatment of LBP

Less than 20% of patients with LBP were treated as inpatients. NSAIDs were the most frequently recommended drugs (Fig. 3). The most common non-pharmacological treatments recommended were exercise, back care information, and physical modalities, in order of frequency (Fig. 4). The physical modalities most frequently recommended to patients with LBP included superficial heating, low frequency TENS, therapeutic ultrasound, and interferential therapy, in order of frequency (Fig. 5). Around 40% of the physiatrists in this study did not use interventional pain procedures in their clinical practice for LBP (Fig. 6). However, spinal injections and dry needling were the most frequently offered interventional treatments. Ninety-five percent of the physiatrists in the study reported that less than one-fifth of their patients with LBP were referred for surgical treatment.

4. Discussion

The present study is a preliminary report that presents the attitudes of European physiatrists to the low back pain. The results showed that physiatrists commonly dealt with patients with low back pain in their daily practice. Most of the patients were not referred to another department and treated with various conservative treatment methods. NSAIDs were the most com-

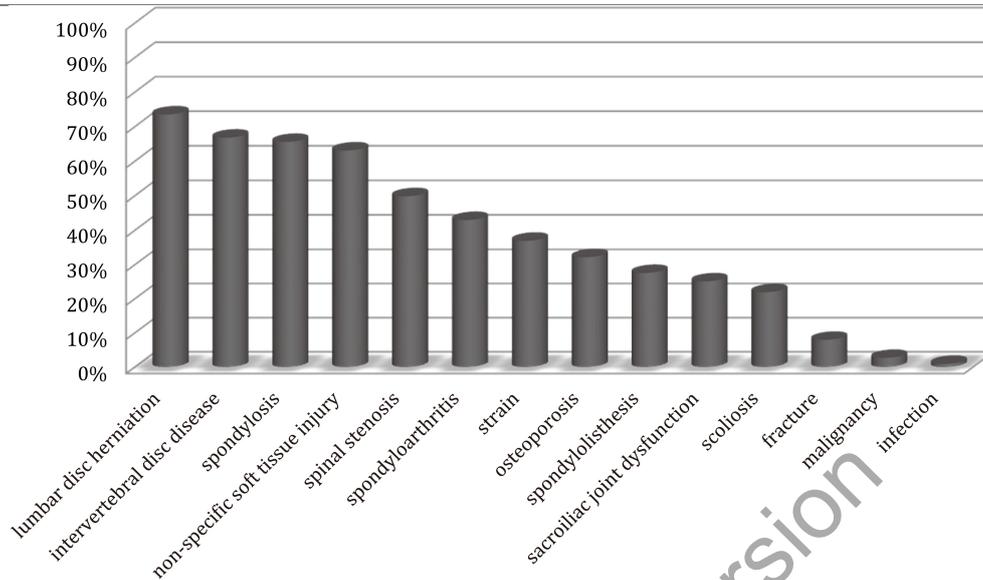


Fig. 1. The most common pathologies in patients with LBP according to the physiatrists.

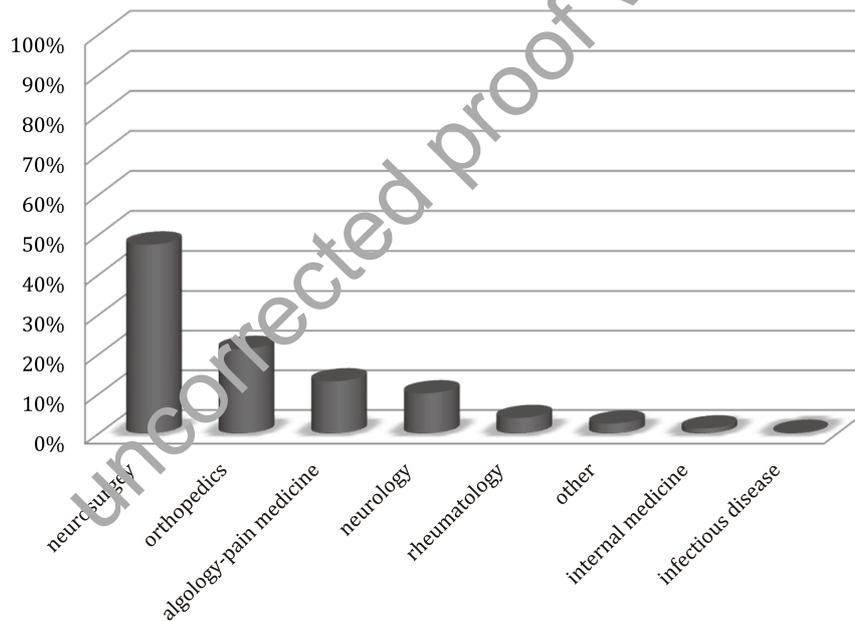


Fig. 2. Frequency of physiatrist referrals to other clinical departments for the treatment of LBP.

153 monly prescribed drugs for low back pain. Exercise, 161
 154 back care information and physical therapy were 162
 155 the most commonly preferred conservative treatments. 163

156 LBP is an important social and economic problem 164
 157 worldwide. It is one of the major causes of absent- 165
 158 teeism. Global Burden of Disease Study 2013 reported 166
 159 that burden of musculoskeletal disorders increases 167
 160 fast and the highest burden belongs to LBP [11,12]. 168

The clinicians should carefully consider the diagnosis, 161
 management, and following of LBP. The physiatrists 162
 are the physician group who mostly face to the disease 163
 in their daily practice. 164

Low back pain is raised from a specific etiological 165
 factor including infection, tumor or osteoporotic frac- 166
 tures only in 5–15% of the cases. Approximately 85% 167
 of the patients with LBP have non-specific low back 168

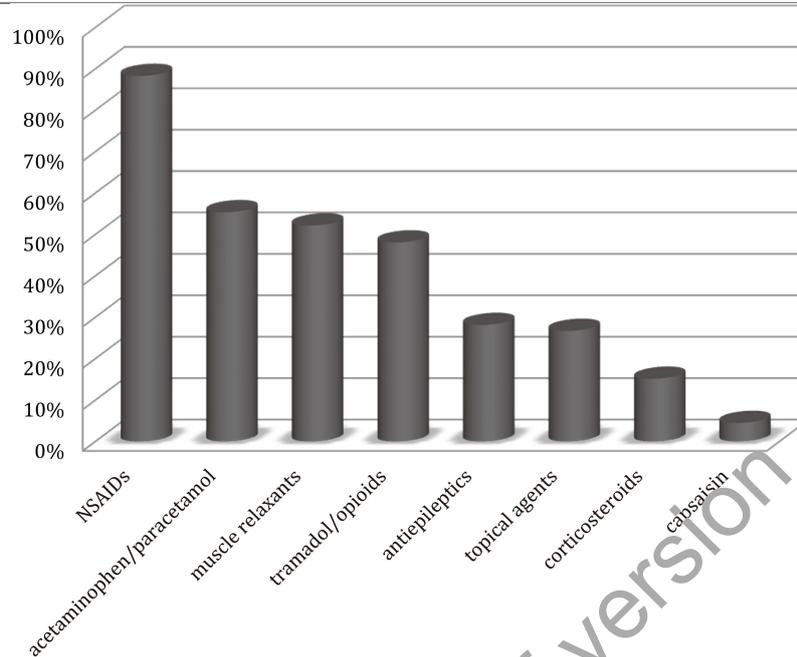


Fig. 3. Pharmacological treatments most frequently recommended to patients with LBP.

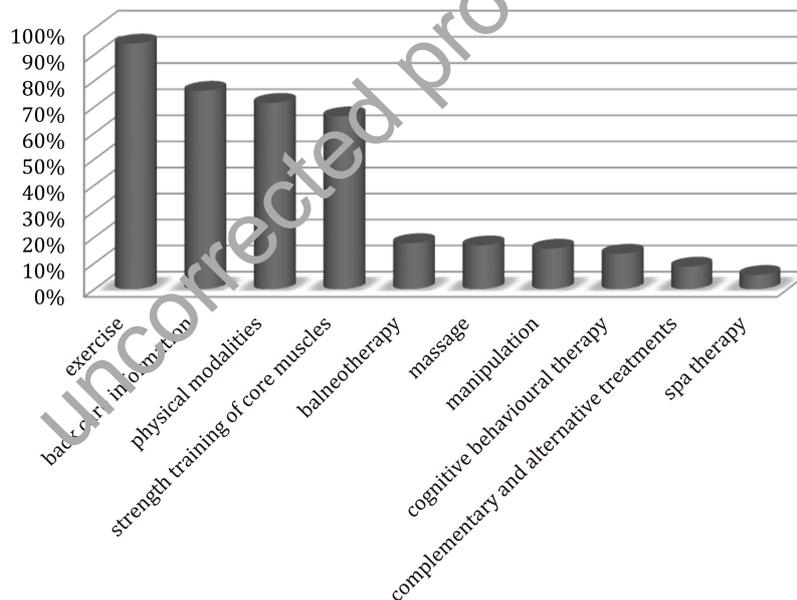


Fig. 4. Non-pharmacological treatments most frequently recommended to patients with LBP.

169 pain [13]. So, the diagnosis of the patients with LBP
 170 is a demanding process. Moreover, imaging findings
 171 and occurrence of low back pain are not strongly re-
 172 lated [14]. So, the physiatrists focus on the discrimina-
 173 tion of the patients with specific or non-specific LBP.
 174 Despite the evolving imaging techniques for spine, his-

175 tory and physical examination is still the most valu-
 176 able clinical evaluation tool for low back pain accord-
 177 ing to physiatrists. The results showed that the physi-
 178 atrists believed that they could rarely establish a clear
 179 diagnosis accounting for low back pain.

180 The underlying mechanism of nonspecific LBP is

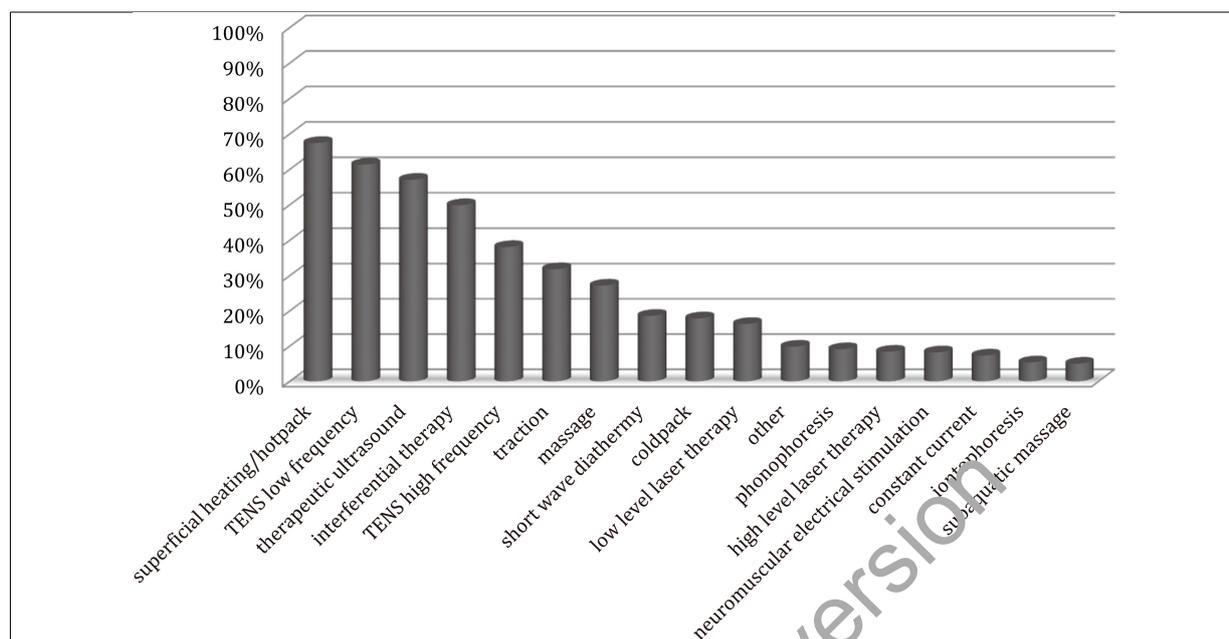


Fig. 5. Physical modalities most frequently recommended to patients with LBP.

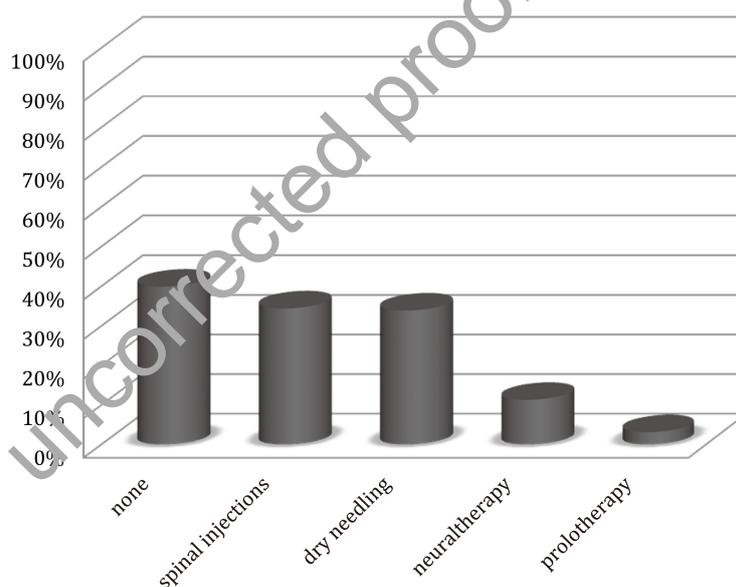


Fig. 6. Interventional treatments most frequently offered to patients with LBP.

181 likely to be multifactorial. So, establishing the pain
 182 generator is too difficult. The imaging tool can be in-
 183 adequate to discriminate underlying mechanism. The
 184 physiatrists in the study do not require MRI for more
 185 than half of the patients. Even MRI is the best imaging
 186 tool for diagnosis of patients with radicular symptoms,
 187 it can not be enough to detect whether a disc is painful.
 188 Imaging for LBP is not recommended within the first

6 weeks unless red flags are present [15]. If the clinic
 component is not definitely clear or in the presence of
 neurological deficit, MRI can be considered [16,17]. It
 is recommended that the patients with nonspecific LBP
 should be restrictive to imaging.

NSAIDs were the most commonly prescribed drugs
 for low back pain by the physiatrists. The European
 Guidelines of the management of chronic LBP recom-

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mends NSAIDs for pain relief in patients with chronic low back pain for short-term periods (up to 3 months) due to the side-effects [18]. In addition, new evidence shows that paracetamol seems as ineffective for low back pain [19].

Many non-pharmacological treatment modalities have been used for treatment of LBP such as exercise, behavioral therapy, spinal manipulation, acupuncture and physical therapy. Exercise, back care information and physical therapy were the most commonly preferred conservative treatments in this study. Exercise therapy is one of the most widely used treatments for LBP. It consists of a heterogeneous group of interventions ranging from general physical fitness to muscle strengthening, flexibility and stretching exercises or some other specific exercise. The Guidelines recommend supervised exercise therapy in patients with chronic low back pain [18]. Specific exercise regimens such as spinal stabilization exercises, McKenzie exercises and other specific exercise regimens are recommended to evaluate in the further.

Physical therapy is one of the most commonly preferred conservative treatments by the participants. However, there has been little evidence to support the use of most passive physical therapies (such as interferential therapy, short-wave diathermy, traction, ultrasound, lumbar supports, taping, and electrical muscle stimulation) in the literature for low back pain [20]. Exceptionally, superficial heat and low-level laser therapy have been found more effective than the sham treatment. Common risk factors for treatment failure of the physical therapy including smoking, workers' compensation status, night pain, and psychiatric history should be carefully evaluated, when the management of LBP is considered [21].

Interventional pain treatment is another option in PRM practice for low back pain. More than half of the physiatrists offer interventional treatments to their patients with low back pain. The patients who lack a strong indication for surgery, have advanced age or medical comorbidities that hindered the surgery, inadequate response to conservative treatment may be candidate for the interventional treatment. Spinal injections and dry needling were the most widely preferred techniques. The spinal injections consist of the techniques using fluoroscopic guidance such as epidural steroid injection, interlaminar approach, transforaminal approach, facet medial branch block and radiofrequency rhizotomy. Fluoroscopy-guided spinal injection treatments for chronic refractory low back pain have been reported safe, effective, and easy to perform interventions [22].

The physiatrist in the study reported that they referred rarely the patients with LBP to the surgical treatment. Surgery is a treatment approach that considered generally less than conservative treatment for LBP. In the literature, several randomized controlled studies that evaluated surgical or nonsurgical treatment found controversial results [23]. Appropriate patients for surgery may consult with surgeon.

5. Conclusion

Healthcare for patients with LBP is primarily provided by the physiatrists. Physiatrists with a wide-range of academic degrees across Europe participated in this study. It is a preliminary report that presents the attitudes of European physiatrists in the management of low back pain. The results showed that physiatrists commonly dealt with patients with low back pain in their daily practice. Most of the patients were not referred to another department and treated with various conservative treatment methods. NSAIDs were the most commonly prescribed drugs for low back pain. Exercise, back care information and physical therapy were the most commonly preferred conservative treatments. The physiatrists in the study reported that they rarely referred the patients with LBP to the surgical treatment. Surgery was generally considered less than conservative treatment for LBP. Exercise, back care information and physical therapy were the most commonly preferred conservative treatments in the study. The preferences in conservative treatment options may vary individually. Further researches are warranted to standardize the conservative management of LBP.

Conflict of interest

None to report.

References

- [1] Urwin M, Symmons D, Allison T, Brammah T, Busby H, Roxby M, Simmons A, Williams G. Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. *Ann Rheum Dis*. 1998; 57: 649-655.
- [2] Stranjalis G, Tsamandouraki K, Sakas DE, Alamanos Y. Low back pain in a representative sample of Greek population: analysis according to personal and socioeconomic characteristics. *Spine (Phila Pa 1976)*. 2004; 29: 1355-1360.

- 293 [3] Hoy D, Brooks P, Blyth F, Buchbinder R. The Epidemiology
294 of low back pain. *Best Pract Res Clin Rheumatol.* 2010; 24:
295 769-781.
- 296 [4] Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD,
297 Michaud C et al. Disability-adjusted life years (DALYs) for
298 291 diseases and injuries in 21 regions, 1990–2010: a system-
299 atic analysis for the Global Burden of Disease Study 2010.
300 *Lancet.* 2012; 380: 2197-2223.
- 301 [5] Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ez-
302 zati M et al. Years lived with disability (YLDs) for 1160 se-
303 quelae of 289 diseases and injuries 1990-2010: a systematic
304 analysis for the Global Burden of Disease Study 2010. *Lancet.*
305 2012; 380: 2163-2196.
- 306 [6] Fairbank JC, Pynsent PB. The Oswestry Disability Index.
307 *Spine (Phila Pa 1976).* 2000; 25: 2940-2952.
- 308 [7] Manniche C, Asmussen K, Lauritsen B, Vinterberg H, Kreiner
309 S, Jordan A. Low Back Pain Rating scale: validation of a tool
310 for assessment of low back pain. *Pain.* 1994; 57: 317-326.
- 311 [8] Kopec JA, Esdaile JM, Abrahamowicz M, Abenham L,
312 Wood-Dauphinee S, Lamping DL, Williams JI. The Quebec
313 Back Pain Disability Scale: conceptualization and develop-
314 ment. *J Clin Epidemiol.* 1996; 49: 151-161.
- 315 [9] Roland MO, Morris RW. A study of the natural history of
316 back pain. Part 1: Development of a reliable and sensitive
317 measure of disability in low back pain. *Spine.* 1983; 8: 141-
318 144.
- 319 [10] Mayer TG, Barnes D, Kishino ND, Nichols G, Gatchel RJ,
320 Mayer H, Mooney V. Progressive isoinertial lifting evalua-
321 tion. I. A standardized protocol and normative database. *Spine*
322 *(Phila Pa 1976).* 1988; 13: 993-997.
- 323 [11] Moradi-Lakeh M, Forouzanfar MH, Vollset SE, El Bcheraoui
324 C, Daoud F, Afshin A, Charara R, Burden of musculoskele-
325 tal disorders in the Eastern Mediterranean Region, 1990–2013:
326 findings from the Global Burden of Disease Study 2013. *Ann*
327 *Rheum Dis.* 2017; 76: 1365-1373.
- 328 [12] Rasmussen-Barr E, Grooten WJA, Hallqvist J, Nohr LV,
329 Skillgate E. Are job strain and sleep disturbances prognostic
330 factors for low-back pain? A cohort study of a general popu-
331 lation of working age in Sweden. *J Rehabil Med.* 2017; 49:
332 591-597.
- [13] Deyo RA, Weinstein JN. Low back pain. *N Engl J Med.* 2001;
333 344: 363-370.
- [14] Van Tulder MW, Assendelft WJ, Koes BW, Bouter LM.
335 Spinal radiographic findings and nonspecific low back pain.
336 A systematic review of observational studies. *Spine* 1997; 22:
337 427-434.
- [15] Chou R, Qaseem A, Snow V, Casey D, Cross JT Jr, Shekelle
339 P, et al., Diagnosis and treatment of low back pain: a joint
340 clinical practice guideline from the American College of
341 Physicians and the American Pain Society. *Ann Intern Med.*
342 2007; 147: 478-91.
- [16] Allegri M, Montella S, Salici F, Valente A, Marchesini M,
344 Compagnone C, et al. Mechanisms of low back pain: a guide
345 for diagnosis and therapy. Version 2. F1000Res 5. 2016.
- [17] Koes BWs, van Tulder MW, Thomas S. Diagnosis and treat-
347 ment of low back pain. *BMJ.* 2006; 332: 1430-1434.
- [18] Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-
349 Moffett J, et al. Chapter 4. European guidelines for the man-
350 agement of chronic nonspecific low back pain. *Eur Spine J.*
351 2006; 15(Suppl 2): S197-300.
- [19] Machado GC, Maher CG, Ferreira PH, Pinheiro MB, Lin
353 CW, Day RO, et al. Efficacy and safety of paracetamol for
354 spinal pain and osteoarthritis: systematic review and meta-
355 analysis of randomised placebo controlled trials. *BMJ.* 2015;
356 350: h1225.
- [20] Chou R, Deyo R, Friedly J, Skelly A, Weimer M, Fu R, et
358 al. Systemic Pharmacologic Therapies for Low Back Pain:
359 A Systematic Review for an American College of Physicians
360 Clinical Practice Guideline. *Ann Intern Med.* 2017; 166: 480-
361 492.
- [21] Eleswarapu AS, Divi SN, Dirschl DR, Mok JM, Stout C, Lee
363 MJ. How Effective is Physical Therapy for Common Low
364 Back Pain Diagnoses? A Multivariate Analysis of 4597 Pa-
365 tients. *Spine (Phila Pa 1976).* 2016; 41: 1325-1329.
- [22] Iannuccilli JD, Prince EA, Soares GM. Interventional spine
367 procedures for management of chronic low back pain—a
368 primer. *Semin Intervent Radiol.* 2013; 30: 307-317.
- [23] Mirza SK, Deyo RA. Systematic review of randomized tri-
370 als comparing lumbar fusion surgery to nonoperative care for
371 treatment of chronic back pain. *Spine (Phila Pa 1976).* 2007;
372 32: 816-823.
- 373