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ORIGINAL CONTRIBUTION

CME

Direct-access physiotherapy to help manage patients with musculoskeletal disorders in an emergency department: Results of a randomized controlled trial

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Abstract

Objectives: The objective was to evaluate the effects of direct-access physiotherapy on patients presenting with a musculoskeletal disorder (MSKD) to the emergency department (ED) on clinical outcomes and use of health care resources.

Methods: We conducted a randomized controlled trial in an academic ED in Québec City, Canada. We included patients aged 18 to 80 years with minor MSKD. The intervention group had direct access to a physiotherapist (PT) in the ED immediately after triage and prior to physician assessment, and the control group received usual care by the emergency physician without PT intervention. The key variables included clinical outcomes (pain, interference of pain on function) and resources use (ED return visit, medications, diagnostic tests, additional consultations). They were analyzed using descriptive statistics and compared between groups using two-way analyses of variance, log-linear analysis, and chi-square tests.

Results: Seventy-eight patients suffering from MSKDs were included (40.2 ± 17.6 years old; 44% women). For the primary clinical outcome, participants in the PT group (n = 40) had statistically lower levels of pain and pain interference at 1 and 3 months. In terms of resource use, participants in the PT group returned significantly less often to the ED. At baseline and 1 month, less prescription medication was used, including opioids, but there were no differences at 3 months. Although over-the-counter medication was recommended more at baseline in the PT group, there were no differences in use at 1 month, and the PT group had used them less at 3 months. There were no

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Trial registration: This trial is registered at the U.S. National Institutes of Health (ClinicalTrials.gov), NCT04009369.

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differences between groups at follow-up for imaging tests, other professionals consulted, and hospitalization rates.

Conclusion: Patients presenting with a MSKD to the ED with direct access to a PT had better clinical outcomes and used less services and resources than those in the usual care group after ED discharge and up to 3 months after discharge.

KEYWORDS
advanced practice, direct access, emergency department, musculoskeletal disorders, physiotherapy

INTRODUCTION

Musculoskeletal disorders (MSKDs) are highly prevalent and are often associated with pain, stiffness, loss of joint mobility, deformity, and/or physical limitations.[1] MSKDs are one of the major drivers of increase in years lived with disability, low back pain alone being the worldwide leading cause of this worrisome finding.[2] Direct costs of MSKDs are rapidly increasing, including costs for consultations with health care professionals, imaging tests, and medication.[3,4] Indirect costs, such as loss of productivity, are however considered to be the largest contributing factor to MSKDs expenditures.[4] For low back pain, inflation-adjusted societal costs were estimated at 26.40 billion USD in the United Kingdom and 81.24 billion USD in the United States in 2015.[5]

The emergency department (ED) remains one of the most common settings patients turn to when presenting a MSKD.[6] For example, in Australia, up to 25% of ED presentations are for MSKDs.[7] In Canada, 9% of patients presenting to the ED suffer from low back pain.[8] Numerous reasons have been put forward to explain why persons go to the ED for such conditions. In a 2007 American survey, more than 40% of patients believed that their primary care provider was incapable of correctly managing MSKDs.[9] Other reasons include lack of access to a general practitioner, functional loss, feeling that current pain was different from other episodes, desire for quick pain relief or additional investigation including imaging tests, and advice of others to consult the ED.[10]

Therefore, physiotherapists (PTs) have been integrated in EDs in several countries to manage patients with MSKDs directly after triage by the ED nurse, in models often referred to as direct-access or advanced practice PT in the ED.[11,12] Access to PT services in a timely manner for MSKDs has been associated with a decrease in psychological symptoms, decreased risks of developing persistent pain, decreased costs, and utilization of the health care services.[13-18] Countrywide initiatives to integrate PTs in EDs in Australia and the United Kingdom have been found to reduce wait times, length of stay, the prescription of unnecessary consultations, and useless diagnostic tests.[7,11,19,20] Some studies show promising results regarding diagnostic agreement between PTs and ED physicians or other specialists[21] and high patient satisfaction regarding PT care in the ED.[22] However, to the best of our knowledge, to date, only three randomized controlled trials assessing the effects of the integration of PTs in EDs have been performed.[23-25] Furthermore, very few studies have measured the effects over time on the clinical course of patients and the use of services and resources.

Therefore, to address this shortcoming in the current state of knowledge, the objectives of our project were to compare the effects of direct-access PT to usual care provided by an emergency physician for ED patients presenting with a MSKD on the clinical course of patients (pain and pain interference) and the use of resources at ED discharge and at 1 and 3 months.

METHODS

Study design

This study was a randomized controlled trial that aimed to compare the effects of direct-access PT to usual care provided by an emergency physician for patients presenting to the ED with a MSKD. The study was approved by the Research Ethics Committee of the CHU de Québec–Université Laval and registered at the U.S. National Institutes of Health #NCT04009369.

Study setting and population

This trial was carried out at the CHU de Québec–Université Laval within the Centre Hospitalier de l'Université Laval (CHUL), an academic ED located in Québec City (Canada). Eligible patients presented to the ED with a suspected minor MSKD, traumatic or not, and were given a triage score of 3 (urgent), 4 (less urgent), or 5 (non-urgent) according to the Canadian Emergency Department Triage and Acuity Scale classification.[26] Further inclusion criteria were: (1) being aged between 18 and 80 years, (2) having the ability to legally consent to participate, (3) understanding French to complete the study questionnaires either orally or in writing, and (4) being a beneficiary of the provincial health insurance plan (Régie de l'assurance maladie du Québec). Patients were excluded if they presented with a major MSKD requiring emergent care (e.g., open fracture, dislocation, open wound), a red flag (e.g., progressive neurological disorder,

infectious symptoms), a concomitant unstable clinical condition (e.g., pulmonary, cardiac, digestive, and/or psychiatric), or if they were currently hospitalized or lived in a long-term care facility. For feasibility reasons, the recruitment of participants took place 13 hours per week, spread over between 1 p.m and 9 p.m. according to varying schedules, from Monday to Friday. Recruitment periods were based on MSKDs peak consultation periods reported in the study setting. The PT was present on site for the entire 13-hour data collection period.

Study procedures

Two groups of participants were recruited over a 24-week period between September 2018 and March 2019: one group of participants had direct access to a PT (PT group) while the control group (CTL group) was managed according to usual ED practice by the emergency physician. To control for the types of MSKD between groups, participants were stratified according to the body part affected (lower back or leg or upper back, neck, and arm). Block randomization was used to assign participants to either group. The feasibility of the randomization method was validated during a 3-day observation period before the beginning of the data collection. The randomization sequence was generated by the principal investigator (LJH) and group allocation was unveiled by RG who opened a sealed envelope at the ED after triage by the ED nurse and patient enrollment. Follow-ups at 1 and 3 months were made either by mail or over the phone.

Study recruitment

Potential MSKD participants were identified based on information collected by the triage nurse and included within the electronic information system used at the CHUL to register patients. After identification in the system, the research coordinator (RG) went to the waiting room to speak with the patient, verify eligibility, describe the research project, answer questions, and obtain written informed consent. Each participant was then allocated to either group via the previously stated randomization procedure. All refusals were recorded and documented.

Study interventions

Participants in the PT group were initially assessed by a PT following nurse triage. After obtaining a brief history of the injury and of clinical signs and symptoms, the PT performed a brief physical examination of each patient. Interventions were then recommended based on the clinical analysis and PT diagnosis, including advice, technical aids, imaging, prescribed or over-the-counter medication, and consults with other health care professionals. There was no follow-up by the PT: each participant was encouraged to see a PT outside the ED if deemed necessary. Immediately after each consultation, the PT filled a standardized form containing a summary of the initial assessment, including diagnosis, and the recommended clinical management. The PT also completed the usual clinical note in the patient's medical record. The form and a copy of the note were then added to the ED consultation request. In the context of this innovative study, the CHUL internal policy was to have every patient presenting to the ED seen by the ED physician prior to discharge. The emergency physician was free to use the PT's recommendations or not but was encouraged to consult and discuss with the PT, if judged relevant. As for participants in the CTL group, they received usual care consisting in the ED physician assessment followed by their choice of interventions that were documented in the patient's file. If deemed appropriate, the ED physician could refer participants to a PT service outside the ED, but they were not treated by the ED PT.

Outcome measures

Our primary outcomes were pain interference on function and pain intensity, which were measured right after enrollment, after the PT's or emergency physician's assessment and at 1 and 3 months post–ED visit. Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), an 11-point scale ranging from 0 (no pain) to 10 (worst pain imaginable). Pain interference on function was measured using the Pain Inventory subscale of the short version of the Brief Pain Inventory (BPI). This subscale covers 10 activities of daily living (e.g., general activity, mood, walking, work, sleep) where the respondent is asked to indicate the extent to which pain experienced in the past 7 days interfered with each of these activities on a scale of 0 to 10. A score of 0 means that the pain experienced did not interfere with the activity and 10 that the pain completely interfered with the activity. Both tools have been recognized as being reliable, valid, and responsive.[27-31] They were self-administered using paper format at the ED and given to the participant by RG. Secondary variables related to utilization of services and resources at ED discharge were documented from the above-mentioned standardized forms and patient's paper and electronic record by RG right after each participant's ED visit. They included the following: types of interventions recommended (advice and education, exercises, technical aid, hospitalization, medication), health care professionals consulted, and imaging tests recommended. The BPI, NPRS, ED return visits, hospitalization rate, number and types of consultations, imaging tests, medication used, and adverse outcomes were collected at 1 and 3 months following ED discharge using a self-reported online questionnaire sent to participants via email or through structured telephone interviews, according to patient preference and availability. Finally, since catastrophic thoughts are associated with the development of impairments and persistent pain over the longer term, participants completed the PCS-CF scale right after enrollment to ensure consistency between the two groups.

Data analysis and sample size

Descriptive statistics were used to characterize participants. Two-sample Kolmogorov–Smirnov tests and chi-square tests were used to compare characteristics of participants between groups at baseline. We used nonparametric repeated-measures analyses of variance (two-way ANOVAs) for longitudinal data (R software, 3.6.1, package nparLD, 2.1, proc f1.LD.f1) to measure differences between groups over time for BPI and NPRS scores (two groups × three times). These analyses are more robust than parametric and semiparametric procedures as they can accept a change in distribution over time, are unaffected by extreme values, and can be used with smaller samples or ordinal scales.[32] Furthermore, nparLD ANOVAs are designed so that there is no need to impute values when patients are lost to follow-up. Hence, per-protocol analyses were conducted.[32,33]

Multiway frequency analysis was performed to compare secondary variables between groups across time points (SPSS 25, proc hiloglinear).[34] Chi-square tests were used to compare data between groups at each time point individually (producing exact p-values). These analyses on secondary outcomes were considered exploratory. To calculate the effect size, Glass's delta was used since the standard deviation (SD) of both groups were statistically different. The alpha criterion was set at 0.05 for all statistical analyses.

An a priori sample size was based on the minimum clinically important difference (MCID) of the BPI estimated to be 1.00.[35,36] Using G*Power 3.1.9.2, we estimated a required sample-size of 45 participants per group based on α = 0.05, effect size = 0.66, power [1−β] = 0.80, SD1 = 1.43, SD2 = 1.59 BPI points, MCID = 1.00 BPI points, loss to follow-up = 20%.

RESULTS

Participants

Overall, 579 MSKD patients were assessed for eligibility between September 2018 and March 2019 and 78 were recruited (Figure 1). Ten participants declined to participate because they wanted to be exclusively managed by the emergency physician. Two participants did not receive the allocated intervention in the CTL group because they left the ED before seeing the emergency physician, but they still participated in the 1- and 3-month follow-ups. Fifteen participants were lost to follow-up at 1 month (follow-up rate = 83.2% [CTL group = 88.9%, PT group = 77.5%]) but four of them were successfully contacted at 3 months. Sixteen participants were lost to follow-up at 3 months (follow-up rate = 79.5% [CTL group = 79.0%, PT group = 80.0%]). Participants lost to follow-up lived significantly more often alone (CTL group) and were significantly less often registered with a family physician (PT group). No adverse events were reported.

Regarding baseline characteristics, there were no statistically significant differences between groups for all variables, except for age and sex (Table 1). There were more women in the PT group

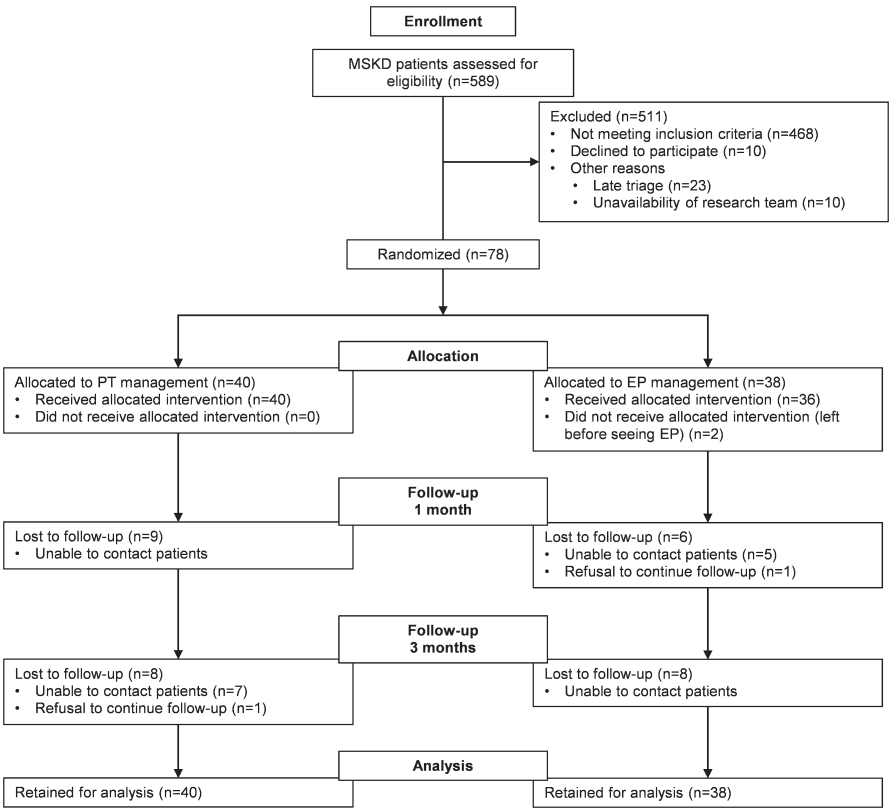

FIGURE 1 CONSORT flow diagram of participants through the trial. MSKD, musculoskeletal disorder; PT, physiotherapy

TABLE 1 Baseline characteristics of study participants (*n* = 78)

Characteristics	CTL (*n* = 38)	Lost to follow-up (*n* = 8)	PT (*n* = 40)	Lost to follow-up (*n* = 8)
Age (yr), mean (±SD)	44.1 (±17.3)	36.25 (±15.5)	36.6 (±17.3)*	30.4 (±11.6)
Sex, *n* males (%)	26 (68.4)	7 (87.5)	18 (45.0)**	6 (75.0)
Triage category in ED, *n* (%)				
Urgent (P3)	16 (42.1)	3 (37.5)	16 (40.0)	3 (37.5)
Semiurgent (P4)	21 (55.3)	4 (50.0)	24 (60.0)	5 (62.5)
Nonurgent (P5)	1 (2.6)	1 (12.5)	0 (0)	0 (0)
Living arrangements, *n* (%)				
Alone	8 (21.1)	4 (50.0) *	10 (25.0)	2 (25.0)
With family/spouse	30 (78.9)	4 (50.0)	30 (75.0)	6 (75.0)
Occupation, *n* (%)				
Medical leave due to present complaint	2 (5.3)	1 (12.5)	3 (7.5)	2 (25.0)
Medical leave for other reason	3 (7.9)	1 (12.5)	0 (0)	0 (0)
Working full time	19 (50.0)	5 (62.5)	18 (45.0)	4 (50.0)
Working part time	4 (10.5)	0 (0)	2 (5.0)	0 (0)
Student	3 (7.9)	1 (12.5)	10 (25.0)	1 (12.5)
Other	7 (18.4)	0 (0)	7 (17.5)	1 (12.5)
Loss of wages since onset, yes *n* (%)	3 (7.9)	0 (0)	3 (7.5)	2 (25.0)
Personal income, *n* (%)				
$1–$49,999	24 (63.2)	5 (62.5)	25 (62.5)	5 (62.5)
$50,000–$99,999	11 (28.9)	2 (25.0)	11 (27.5)	1 (12.5)
≥$100,000	1 (2.6)	1 (12.5)	0 (0)	0 (0)
Highest level of education completed, *n* (%)				
Primary or high school	14 (36.8)	5 (62.5)	5 (12.5)	2 (25.0)
College or university	24 (63.2)	3 (37.5)	34 (85.0)	6 (75.0)
Time since onset of symptoms, *n* weeks (%)				
0–2	32 (84.2)	8 (100.0)	30 (75.0)	7 (87.5)
3–12	1 (2.6)	0 (0)	4 (10.0)	0 (0)
>12	4 (10.5)	0 (0)	4 (10.0)	1 (12.5)
Don't know	1 (2.6)	0 (0)	1 (2.5)	0 (0)
Other health conditions, yes *n* (%)	18 (47.4)	2 (25.0)	13 (32.5)	2 (25.0)
Mode of arrival in the ED, *n* (%)				
Ambulance	7 (18.4)	1 (12.5)	6 (15.0)	1 (12.5)
Private or public transport	29 (76.3)	7 (87.5)	28 (70.0)	5 (62.5)
Foot	1 (2.6)	0 (0)	6 (15.0)	2 (25.0)
Other	0 (0)	0 (0)	0 (0)	0 (0)
Registered to a family physician, *n* (%)	30 (78.9)	6 (75.0)	33 (82.5)	2 (25.0)**
Pain catastrophizing, mean (±SD)	22.4 (±11.8)[a]	16.0 (±10.1)	18.3 (±13.2)[b]	21.4 (±11.6)

Abbreviations: CTL, control group; PT, physiotherapy group.

[a]*n* = 35.

[b]*n* = 39.

*p < 0.05.

**p < 0.01.

and their mean age was significantly lower. Hence, we used these characteristics as covariates in our analysis. Moreover, participants in the CTL group had a mean (±SD) pain catastrophizing score of 22.4 (±11.8)/100 while those in the PT group had a score of 18.3 (±13.2)/100, thus indicating a lower level of catastrophization regarding the pain felt.

TABLE 2 Pain intensity and pain interference at baseline and at 1- and 3-month follow-ups

		CTL	*n*	PT	*n*	Mean difference (95% CI)	Effect size (Glass Δ)	p-value	Post-hoc p-values
NPRS, mean (±SD)	Group							0.0097	
	Time							<0.0001	
	Interaction							0.00053	
	Pre	6.7 (±2.2)	38	6.9 (±2.0)	39	0.2 (−1.1, 0.8)			0.676
	Post[a]	5.6 (±3.0)	13	5.5 (±2.7)	32	−0.1 (−1.9 to 1.8)			—[a]
	1 month	3.7 (±2.9)	32	1.8 (±2.4)	31	−1.9 (−3.2 to −0.7)	−0.655		0.0062
	3 months	2.6 (±2.7)	30	−1.6 (−2.8 to −0.5)	32	−1.6 (−2.8 to −0.5)	−0.630		0.0014
BPI, mean (±SD)	Group							0.0018	
	Time							<0.0001	
	Interaction							0.048	
	Pre	4.4 (±1.8)	38	4.1 (±2.3)	40	−0.2 (−1.1 to 0.7)			0.582
	1 month	3.0 (±2.3)	32	1.6 (±2.1)	31	−1.5 (−2.6 to −0.3)	−0.609		0.0033
	3 months	1.8 (±2.0)	30	0.7 (±1.4)	32	−1.1 (−2.0 to −0.2)	−0.550		0.0078

Abbreviations: BPI, Brief Pain Inventory (0–10, 0 = no pain interference on function); CTL, control group; NPRS, Numeric Pain Rating Scale (0–10, 0 = no pain); post, postintervention; pre, preintervention; PT, physiotherapy group.

[a]Since the postintervention NPRS questionnaires were filled by the CTL group after seeing the emergency physician and given that (1) the research coordinator (RG) had sometimes already left and (2) few of them were sent back (*n* = 13), the preintervention NPRS scores were used for the multivariate analysis. However, mean postintervention NPRS scores are also reported.

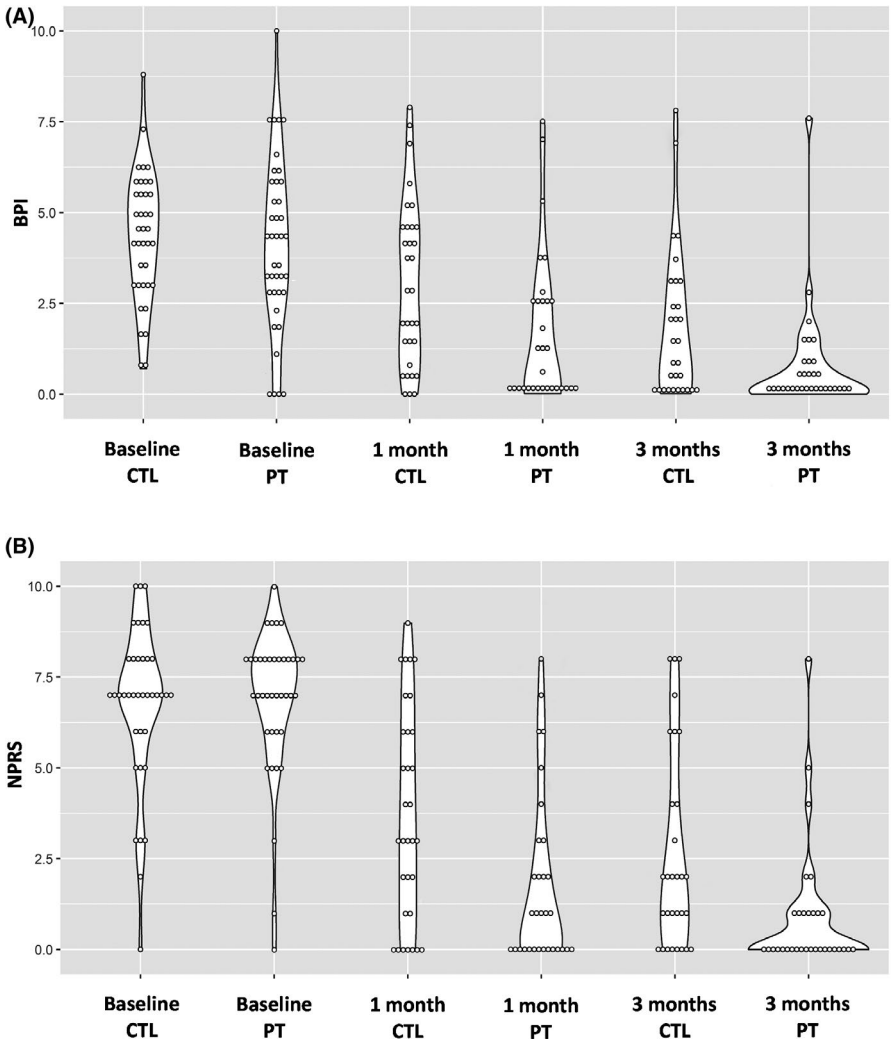

FIGURE 2 Violin plot of the scores for each group at baseline, 1 and 3 months. A, BPI scores. B, NPRS scores. BPI, Brief Pain Inventory (0–10, 0 = no pain interference on function); CTL, control group; NPRS, Numeric Pain Rating Scale (0–10, 0 = no pain); PT, physiotherapy group

Effect of direct-access PT on pain intensity and pain interference

Our analysis showed significant group effect, time effect, and group × time effect on the BPI and NPRS scores (Table 2, Figure 2A–B). Both groups showed significant improvements over time (NPRS, $p < 0.0001$; BPI, $p < 0.0001$; Table 2), but participants in the PT group had a greater improvement at the 1- and 3-month follow-ups compared to the CTL group (NPRS, $p = 0.0005$; BPI, $p = 0.048$; Table 2). Both groups achieved MCIDs for the NPRS (MCID = 1.3 points) and BPI scores (MCID = 1.0 points) at 1 month, but scores in the PT group were significantly lower than those in the CTL group (Table 2). Differences in scores at 3 months remained significantly lower in the PT group than those in the CTL group; mean scores of participants seen by the PT were 1.6 points lower for the NPRS and 1.1 points lower for the BPI compared to the CTL group at the 3-month follow-up (Table 2).

We were unable to recruit 90 participants as originally planned due to a lack of funds to continue data collection. It is, therefore, important to note that in the present project, effective power was evaluated at 98.1% for pain interference with function and 81.8% for pain intensity. These powers were calculated using G*Power 3.1.9.2 software by performing a difference analysis between two independent means (two groups). The following data were used: means and SDs of pain interference with function and pain intensity at 3 months for the CTL group and the PT group, the number of participants completing the 3-month follow-up in both groups and a probability of error α of 0.05.

Comparisons of use of services and resources

We found significant differences between groups at ED discharge regarding proportions of prescription and over-the-counter medication and imaging tests (recommended in the case of the PT but prescribed in the case of the emergency physician). The PT recommended significantly less prescribed medication and imaging tests but more over-the-counter medication than the emergency physician at the ED (Table 3). After 1 month, participants in the PT group had returned significantly less often to the ED and had used less prescription medication, including opioids, than participants in the

TABLE 3 Recommendation and use of services and resources between groups at baseline and 1- and 3-month follow-ups

	CTL % (*n*)	PT % (*n*)	Difference in proportions (95% CI)	Effect size (95% CI)
ED visit	(*n* = 36)	(*n* = 40)		
Hospitalization	2.8 (1)	0.0 (0)	−2.8 (−8.1 to 2.6)	−0.12 (−0.18 to −0.12)
Prescription Mx*	66.7 (24)	42.5 (17)	−24.2 (−45.9 to −2.4)	−0.24 (−0.46 to −0.01)
Opioids**	38.2 (13)	2.6 (1)	−35.6 (−50.0 to −17.2)	−0.45 (−0.62 to −0.27)
Over-the-counter Mx**	11.1 (4)	70.0 (28)	58.9 (41.4 to 76.4)	0.60 (0.41 to 0.77)
Imaging tests**	77.8 (28)	37.5 (15)	−40.3 (−60.5 to −20.0)	−0.41 (−0.62 to −0.19)
1 month	(*n* = 32)	(*n* = 31)		
ED return visits**	21.8 (7)	0.0 (0)	−21.8 (−32.3 to −6.5)	−0.34 (−0.41 to 0.34)
Hospitalization	3.1 (1)	3.2 (1)	0.1 (−7.5 to 6.9)	0.01 (−0.20 to 0.23)
Prescription Mx**	71.9 (23)	32.3 (10)	−39.6 (−62.2 to −18.2)	−0.40 (−0.60 to −0.17)
Opioids*	34.4 (11)	12.9 (4)	−21.5 (−38.2 to −2.9)	−0.25 (−0.46 to −0.04)
Over-the-counter Mx	58.1 (18)	38.7 (12)	−19.4 (−41.6 to 1.6)	−0.19 (−0.43 to 0.03)
Consultation with another professional	65.6 (21)	54.8 (17)	−10.8 (−38.1 to 6.4)	−0.11 (−0.35 to 0.15)
Imaging tests	15.6 (5)	19.4 (6)	3.8 (−14.7 to 16.9)	0.05 (−0.21 to 0.29)
3 months	(*n* = 30)	(*n* = 32)		
ED return visits	3.3 (1)	0.0 (0)	−3.3 (−8.1 to 2.6)	−0.13 (−0.21 to −0.12)
Hospitalization	0.0 (0)	0.0 (0)	0.0 (0 to 0)	—
Prescription Mx	33.3 (10)	21.9 (7)	−11.4 (−29.1 to 8.5)	−0.13 (−0.37 to 0.14)
Opioids	13.3 (4)	3.1 (1)	−10.2 (−20.0 to 2.7)	−0.19 (−0.36 to 0.03)
Over-the-counter Mx*	43.3 (13)	18.8 (6)	−24.5 (−40.3 to −1.9)	−0.27 (−0.48 to −0.03)
Consultation with another professional	50.0 (15)	46.9 (15)	−3.1 (−26.2 to 17.8)	−0.03 (−0.29 to 0.24)
Imaging tests	6.7 (2)	18.8 (6)	12.1 (−3.9 to 25.4)	0.18 (−0.10 to 0.42)

Abbreviations: CTL, control group; Mx, medication; PT, physiotherapy group.

*$p < 0.05$.

**$p < 0.01$.

CTL group (Table 3). There were no differences in the use of over-the-counter medication, other professionals consulted, and imaging tests administered. At 3 months, participants in the PT group used less over-the-counter medication than participants in the CTL group, but there were no significant differences in ED return visits, prescription medication, additional imaging tests used, and consultations with another professional (Table 3). No differences were found in hospitalization rates between groups at all time points.

DISCUSSION

In this study, participants in the PT group presented significantly lower pain intensity and pain interference than those in the CTL group at 1 and 3 months, and these differences between groups persisted over time (interaction effect). Indeed, mean pain intensity level in the PT group dropped by 6.0 points between baseline and the 3-month follow-up and mean pain interference on function dropped by 3.4 points. These improvements exceeded clinically important difference thresholds (1.3 NPRS points, 1.0 BPI points).[28,35] Comparatively, NPRS scores dropped by 4.1 points and BPI scores by 2.6 points in the CTL group. These differences in scores could be partially explained by the quality of the reassurance and education given by the PT. Indeed, in previous studies,[37,38] patients seen by a direct-access PT reported greater satisfaction regarding education or first aid advice than those seen by a physician. They attributed this increase to receiving proper information and education and having time to ask questions.[38] Other studies show mixed results for pain outcomes. In a study by Lau et al.,[23] patients seen by the PT expressed significantly less pain at discharge from the ED and within 1 week of discharge, but these differences were no longer significant at the 1-month follow-up. Other studies on direct-access PT or advanced practice in the ED (i.e., PTs managing patients with MSKDs directly after triage by the ED nurse) report no significant differences in pain levels at baseline and up to 6 months after ED visit.[24,37,39,40] More broadly, studies concerning early access to PT in various clinical settings also suggest mixed results, patients with early access presenting either a significant decrease or no change at all in their pain level after 6 months.[14,15,20] However, as reported by Kilner et al.,[41] most of these studies are of poor methodological quality and considered as low-level evidence. Our study differs from prior studies in that it provides data on the clinical effectiveness of the new service model and used validated outcome measures. To the best of our knowledge, this is the first study presenting data on pain interference for patients managed by a PT in the ED.

Furthermore, use of several services and resources was significantly lower for participants in the PT group compared to those in the CTL group at discharge and 1 and 3 months. At discharge, participants in the CTL group had been prescribed about 40% more diagnostic imaging tests than what was recommended by the PT. These results are consistent with others found in the literature.[37,42] In recent clinical guidelines, imaging is discouraged for patients presenting with MSKDs unless a serious pathology is suspected or if imaging is likely to change management.[43,44] According to Baker et al.,[45] approximately 40% of imaging referrals for patients presenting with a nontraumatic MSKD to the ED is inconsistent with guideline recommendations. In a study by Ross et al.,[46] PTs showed significantly greater knowledge regarding optimal management strategies for low back pain patients when compared to family practice physicians. Moreover, when examining the PT's assessment, Décary et al.[21] found high inter-rater agreement for common knee disorders between the diagnosis made by the PT using only a musculoskeletal examination and the physician's diagnosis made using both musculoskeletal examination and imaging. The musculoskeletal examination performed by the PT has also been found to be of high diagnostic validity. While no studies have been done on the subject, given these findings and prior work comparing PTs and family physicians,[46] it is possible that the differences observed in the PT's recommendation for imaging may be due in part to greater adherence to clinical practice guidelines. As reported, even if imaging testing recommendation during the ED visit was significantly lower in the PT group, there were no differences between groups for use of additional imaging tests at 1 and 3 months. No adverse outcomes were reported in both groups, suggesting that direct-access PT management was appropriate.

The use of over-the-counter and prescription medication was different depending on the moment of the treatment trajectory (discharge, 1 month, or 3 months). As reported under Results, at ED discharge, participants in the PT group were recommended on average 25% less prescription medication but around 60% more over-the-counter medication than those in the CTL group. Furthermore, participants in the PT group had used 40% less prescription medication at 1 month, including opioids, and 25% less over-the-counter medication at 3 months compared to the CTL group. In agreement with some clinical guidelines, acetaminophen, anti-inflammatory drugs, or opioids should not be recommended to patients presenting with a MSKD because their efficacy is questionable and they tend to be associated with poorer outcomes.[43,44] Providers should prioritize modalities such as advice to stay active, individualized patient education, and supervised exercise.[43,44] As for ED return visits, no participant in the PT group had returned to the ED in the first 3 months after their ED visit. Comparatively, 21% of participants seen by the emergency physician at 1 month had returned to the ED. To the best of our knowledge, this is the first time that an effect on ED return visits and medication use is measured in a study comparing the effects of management of MSKD by a PT or an emergency physician in ED. The differences in ED return visits rates might be partially explained by the different training and approaches used by the two care providers. As mentioned, current guidelines recommend providing education or information to encourage self-management and to inform and reassure patients about their condition.[43] Patients should also be offered individualized education in addition to usual care.[44] For example, pain neuroscience education for MSKDs has been found to reduce pain, improve patient knowledge of pain, improve function, enhance movement, and minimize health care utilization.[47] Participants in the PT group may have then felt better equipped

and empowered to manage their condition, which may have reduced perceived need for further services and resources over time.

LIMITATIONS

This trial has certain limitations, and some results should be interpreted with caution. Sample size in our study is relatively small. We must then be reasonably careful with the generalization of the results. Also, although sufficient statistical power was obtained, there was a 20% loss to follow-up, which suggests a certain caution in the interpretation of the results obtained. We found significant differences in age and sex between our groups at baseline, the PT group having younger participants and more women. Such differences in allocation might have been caused by the stratification used when randomizing participants because we stratified only according to the area of the body affected and not by sex or age. Women have been found to report higher pain intensity and disability than men for the same condition, to seek more medical care, to cope less efficiently with pain, to be managed differently, and also to receive more prescription medication and at higher doses than men.[48,49] Since there were more women in the PT group than the CTL group, the positive effects of the PT's intervention over time might have been underestimated. However, we used age and sex as covariates in our analysis and hence controlled for this limitation. Also, the groups may have differed for other baseline characteristics that were only present in few participants, thus preventing us from verifying whether a statistical difference was present.

It is possible that quality of the data may have been compromised by recall bias and lack of completeness of the notes written by each of the professionals involved. Another limitation, implicitly imposed from an ethical point of view, is that we did not include a group receiving no treatment at all, hence preventing us from comparing the evolution of our participants with the expected natural healing process overtime. Also, for feasibility reasons, longer-term follow-up of participants was not carried out.

CONCLUSION

The results of this study suggest that direct-access PT in the ED for patients presenting with a musculoskeletal disorder is associated with greater improvements in pain intensity and pain interference and less use of several services and resources at certain time points, such as ED return visits, imaging tests, and prescription medication (including opioids). Further multicenter trials are needed to confirm these findings and should include an economic analysis to ascertain if direct-access physiotherapy in the ED setting is cost-effective.

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AUTHOR CONTRIBUTIONS

Rose Gagnon, Kadija Perreault, Simon Berthelot, Eveline Matifat, Bertrand Achou, Marie-Christine Laroche, Catherine Van Neste, Stéphane Tremblay, and Luc J. Hébert were involved in study concept and design. Rose Gagnon, Kadija Perreault, Simon Berthelot, Marie-Christine Laroche, and Luc J. Hébert were involved in acquisition of the data. Rose Gagnon, Kadija Perreault, and Luc J. Hébert were involved in analysis and interpretation of the data. Rose Gagnon drafted the manuscript. Kadija Perreault, Simon Berthelot, Eveline Matifat, François Desmeules, Bertrand Achou, Marie-Christine Laroche, Catherine Van Neste, Stéphane Tremblay, and Luc J. Hébert were involved in critical revision of the manuscript for important intellectual content. Jean Leblond provided statistical expertise. Rose Gagnon, Kadija Perreault, Marie-Christine Laroche, Catherine Van Neste, Stéphane Tremblay, and Luc J. Hébert were involved in acquisition of funding.

ETHICAL APPROVAL

This trial was approved by the Research Ethics Committee of the CHU de Québec–Université Laval #MP-20-2019-4307.

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