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Original Research

Telemedical Interdisciplinary Care Team Evaluation and Treatment of People With Low Back Pain: A Retrospective Observational Study

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KEYWORDS
Interdisciplinary;
Pain;
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Abstract *Objective:* To evaluate the effects of an interdisciplinary care team (ICT) model delivered by telemedicine on patients with low back pain (LBP).
Design: Retrospective analysis of deidentified pre-existing data.
Setting: Retrospective observational study of patients presenting with LBP to a nationwide telemedicine practice using an ICT model.
Participants: Over a 9-month period all patients with a diagnosis related to LBP and who had an ICT evaluation (medical doctor, advanced practice provider, health coach, and physical therapist) were included in the study (n=36). A minimum of 2 follow-up physical therapy visits were required for inclusion.
Interventions: Patients were evaluated for LBP, received a diagnosis, and were offered a multidisciplinary treatment plan. Additional real-time audio visual medical, health coaching, registered dietician, and physical therapy services were received as deemed clinically appropriate.
Main Outcome Measures: Baseline, 30 day, and final pain (mean 81 day) measurements via numerical pain rating scale (NPRS). Baseline and final Patient-Reported Outcomes Measurement Information System (PROMIS)-10 Global Mental/Physical domains.
Secondary Outcome Measures: Use of prescription medication, referral for imaging, need for injections, or surgery.
Results: 36 patients met criteria. Pain levels included mild (n=6, 16.7%), moderate (n=19, 52.8%), and severe (n=11, 30.6%). Clinically significant pain improvements were noted in

List of abbreviations: CLBP, chronic low back pain; HRQoL, health-related quality of life; ICT, interdisciplinary care team; LBP, low back pain; NPRS, numeric pain rating scale; PROMIS, Patient-Reported Outcomes Measurement Information System.
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83.3% (n=25) of those with moderate or severe pain. PROMIS Mental and Physical Health categorization from Fair/Poor to Good/Excellent significantly improved over time. The initial 20% (n=7) in Fair/Poor Mental Health improved to 6.3% (n=2) at finish, while the 80% (n=28) in Good/Excellent Mental Health at start improved to 93.8% (n=30) at finish. Regarding Physical Health, 51.4% (n=18) rated Fair/Poor at start and 31.3% (n=10) at finish, while the 48.6% (n=17) rated Good/Excellent at start improved to 68.8% (n=22) at finish. The need for prescription medication was low (n=6, 16.7%) and spinal imaging orders were negligible (n=1, 2.8%). Injections were warranted in 11.4% (n=4) of patients and surgical referral with operative treatment in 2.8% (n=1).

Conclusion: Interdisciplinary care delivered through telemedicine can significantly improve pain and support improved health-related quality of life in patients with LBP, with low rates of imaging, prescription, and interventional use.

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Low back pain (LBP) is a leading cause of disability[1] with up to 80% of the US population experiencing this at some point.[2] Though acutely self-limiting, chronic low back pain (CLBP) causes high health care utilization.[3] Most practice guidelines advise avoidance of imaging within 2 months of diagnosis and not prior to exhaustion of non-operative treatment options.[4-8] However, approximately one-third of nonsurgical patients are imaged within 1 month of diagnosis, resulting in doubling of 12-month costs.[9]

Modifiable risk factors for LBP include bodyweight,[10] sedentary lifestyle, prolonged sitting and driving times, and smoking.[11] Low physical activity, self-efficacy, mood disorders, and lack of social supports are correlated to poor treatment adherence.[12] Interventions aimed at supporting these factors may increase the efficacy of care. Health coaching interventions address psychosocial aspects that are important to individuals and incorporate techniques such as motivational interviewing, cognitive behavioral work, and goal setting.[13] Health coaches can participate in patient encounters in real-time audio-visual fashion as part of the telemedicine team. Coaching can increase activity levels in healthy adults[14] as well as some chronic diseases like asthma and diabetes.[15,16] Randomized controlled trials in patients with CLBP found health coaching interventions met satisfied participants, decreased costs, lowered absenteeism, and improved outcomes.[17]

Our interdisciplinary care team (ICT) model consists of a musculoskeletal-trained physician, advanced practice provider, health coach, registered dietician, and physical therapist working in coordination for the treatment of patients with musculoskeletal pain. Interdisciplinary teams are reported to reduce interventions and imaging in Center of Excellence models, and in-person interdisciplinary pain programs improve function more than physiotherapy alone.[18,19] Rapid use of MRI is associated with an increased likelihood of undergoing spine surgery, and multidisciplinary conferences have been associated with decreased utilization of spinal surgeries.[20,21] We examined the effect of an ICT model delivered solely by real-time audio-visual telemedicine on pain and health-related quality of life (HRQoL), to determine if it could feasibly improve LBP and HRQoL and maintain the lower imaging and intervention utilizations observed with in-person programs.

Methods

Data source and patients

A retrospective review of pre-existing patient data identified those with LBP, approved by Chief Medical Officer and Chief Compliance Officer. Informed consent was deemed not applicable because of the nature of the study. Patients presented for care from continental US between January and September 2022. Inclusion criteria consisted of having a diagnosis of LBP, evaluation by our ICT and at least 2 follow-up physical therapy visits to assess both technological appropriateness and safety for inclusion in a home directed virtual program. LBP was identified using ICD-10 codes related to low back pathology.

Patients were excluded if they did not have an ICT evaluation, were or became pregnant, presented for preoperative or postoperative care, or presented directly for ancillary services. We also excluded patients where red flags were present for potentially serious causes of pain such as infection and neoplasm, progressive neurologic deficit, or if outside incident interrupted their plan of care. Patients unable to participate in virtual sessions because of technological barriers were excluded. Patients with prior low back surgery not in the postoperative phase (<12 months) were allowed in the sample.

Patient intake

Patients presented for their ICT visit through our telemedicine platform via smartphone application (Vori Application) or website, for real-time audiovisual visits. A nationally board-certified health coach inquires what matters to the patient to identify patient values and preferences. Depression screening is performed with self-harm evaluation if warranted. Next, a duo of a musculoskeletal specialty physician and advanced practice provider (APP) join the visit to obtain a warm handoff of information directly in front of the patient. This style of handoff involves giving a verbal report about the patient directly in their presence, to promote transparency and accuracy of information. Warm handoffs are supported by the Agency for Healthcare Research and Quality (AHRQ) to improve patient safety.[22] The physician and APP proceed with the visit, potentially ordering labs,

medications, imaging, or referrals. The condition, prognosis, and next steps are then discussed with the patient and understanding ensured. Finally, the physical therapist joins and receives warm handoff, and a physical therapy screening is performed to ensure appropriateness and safety for virtually guided therapy. Interdisciplinary rounds are held once weekly among all clinical team members to discuss patient progress, setbacks, and concerns.

Outcome measures

Health related quality of life (HRQoL) has been identified as a core outcome domain for study of patients with LBP by Delphi consensus, as it assesses psychological functioning and self-rated health, which patients rated as highly important.[23] The Patient-Reported Outcomes Measurement Information System (PROMIS) provides a 10-item PROMIS Global Health (PROMIS-10) tool for assessing HRQoL in adults and children.[24] PROMIS-10 is recommended as a core instrument to assess HRQoL in LBP research.[25] PROMIS-10 measures health status across physical, mental, and social domains and is of low burden to complete.

Primary outcome measures were initial, 30 day, and final numeric pain rating scale (NPRS), and initial and final PROMIS-10 Mental Health (PROMIS-MH) and PROMIS-10 Physical Health scores (PROMIS-PH), subdomains of PROMIS-10 Global. NPRS is responsive in patients with LBP, with a 2-point change on NPRS showing clinically meaningful improvement.[26,27] Low PROMIS-PH scores are associated with higher rate of future health care utilization.[28] Depressive symptoms are associated with worse pain, disability, and recovery in persons with CLBP, and PROMIS-MH has shown strong correlation with legacy depression measures such as SF-36.[29,30] T score cutoffs for PROMIS-MH and PROMIS-PH allow dichotomous division into Excellent/Good and Fair/Poor subgroups.[31,32] This method was used for analysis, since data for minimal clinically important difference of PROMIS-10 Global Health are lacking in literature.

Prior to the ICT visit, thereafter at a monthly cadence, PROMIS-10 was delivered electronically through the application for completion and tracking. NPRS was reported at either individual visits or similarly deployed digitally.

Statistical analysis

Normality analysis in SPSS via Shapiro-Wilk's test ($P>.05$) showed initial NPRS scores were approximately normally distributed, with a skewness of -0.39 (SE=0.393) and kurtosis of -0.697 (SE=0.768).[33-37] Paired *t* test analysis of NPRS changes from initial to 30 day and 30 day to final (average 81 days), as well as PROMIS-MH and PROMIS-PH scores from initial to final was performed using Dotmatics GraphPad. Chi-squared analysis for evaluation of categorical change of PROMIS-MH/PH dichotomous groups was performed using Dotmatics GraphPad with a 1-tailed *P* value.

Results

After inclusion and exclusion criteria were applied, 36 patients (mean age 53.5 years, 52.8% women) remained for analysis (fig 1). Given the asynchronous nature of PROMIS-10 deployment, 1 patient did not complete any PROMIS-10 scales. Demographics, health history, PHQ-2 results, initial pain level, visit count of physical therapy and health coaching, and PROMIS-10 scores with dichotomization were compiled and are presented in table 1. Of 36 patients, 28 had CLBP for greater than 1 year, 6 with chronic pain under 1 year, and 2 with pain of under 6 weeks.

Prior to evaluation by our ICT, 23 patients had undergone various treatment routes including physical therapy, chiropractic care, guided injection, and surgery, while 13 reported no prior treatment (fig 2).

Virtual services provided

After the initial evaluation with the ICT, patients received additional services deemed appropriate (fig 3). As expected, 100% (n=36) of patients continued physical therapy (mean 10.3±5.9 sessions). Health coaching was continued by 69.4% (n=25) of patients (mean 7±7.6 sessions), while only 16.7% (n=6) required a follow-up visit with a physician. Six patients (16.7%) had an average of 8 sessions with a Registered Dietician.

The number of patients requiring prescription medication or referral for injection, surgery, and diagnostic imaging is presented in figure 4. Medications [meloxicam (1), methylprednisolone (4), and alendronate (1)] were prescribed for 16.7% (n=6) of patients. Radiographs were obtained in 1 (2.8%) imaging naïve patient with persistent pain for 12 weeks. No patient required de novo (n=25) or repeat MRI (n=11) imaging. A DEXA was ordered in 1 patient for workup of compression fracture. Patients were referred for in-person services if medically necessary: spinal injections [11.1% (n=4)], surgical consultation [2.8% (n=1), congenital spinal stenosis]. Patients sent for injections or surgery received these treatments at referring partners.

Clinical outcomes

Patient NPRS pain data were compiled for initial level, level at 30 days, and final level (fig 5). Average initial NPRS was 5.6±1.8 improving to 3.2±1.6 at 30 days and further improving to 2.1±1.9 at final ($P<.0001$). On an individual patient level, NPRS improved in 91.6% (n=33), was unchanged in 8.3% (n=3), and worsened in none.

PROMIS-MH and PROMIS-PH domains improved over time, with an average PROMIS-MH improvement of 3.4 points ($P=.03$) and average PROMIS-PH improvement of 4.7 points ($P=.009$). T score cutoff of <40 for PROMIS-MH and <42 for PROMIS-PH was used to separate the Fair/Poor scores from the Good/Excellent scores.

At start, 20.0% (n=7) of patients had Fair/Poor PROMIS-MH scores, decreasing to 6.3% (n=2) of patients at final recording. Inversely, 80% (n=28) had Good/Excellent scores at start, which increased to 93.8% (n=30) at final. Chi-square analysis of group membership and time was significant, chi-square (1, N=67)=2.7, $P=.0496$ (fig 6).

PROMIS-PH groups also improved. Initially, 51.4% (n=18) were Fair/Poor, improving to 31.3% (n=10) at final. Initially, 48.6% (n=17) of patients rated Good/Excellent, increasing to 68.8% (n=22) at endpoint. Chi-square analysis of group

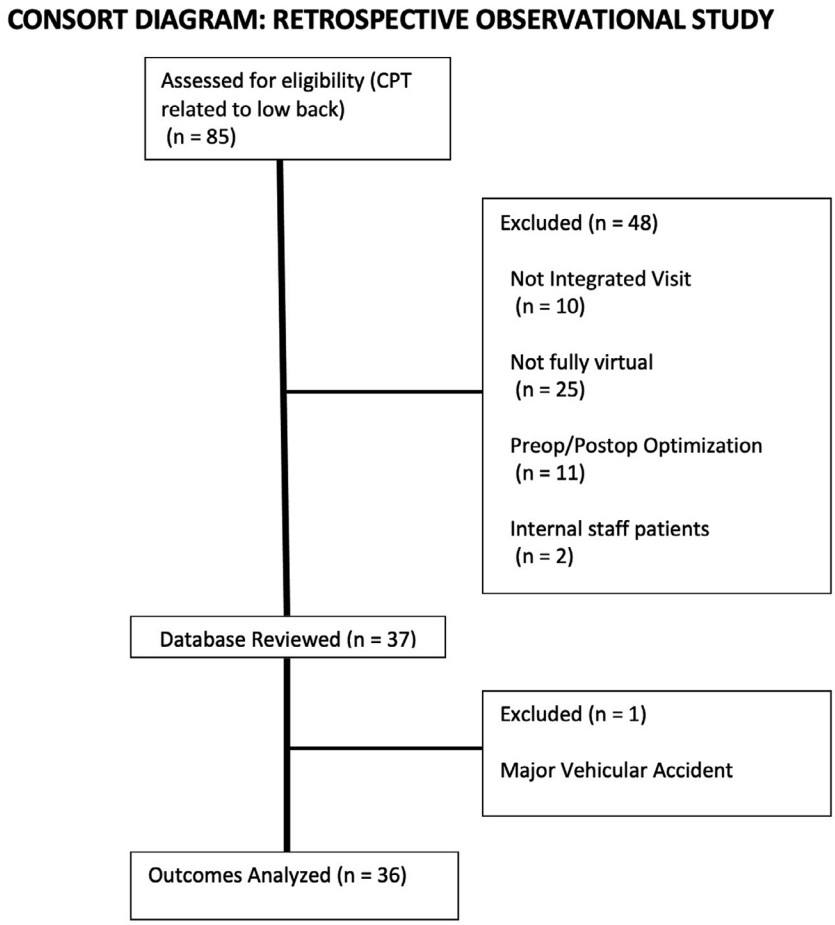

Fig 1 Patient flow diagram.

Table 1 Demographics, health history, and NPRS/PROMIS scoring of patient group at presentation.

Demographic	Subclass	Overall (N=36)
Age (y) ± SD		53.5±15.3
Sex, n (%)	Women	19 (52.8%)
	Men	17 (47.2%)
BMI mean ± SD		31.6±8.4
Obesity, n (%)		18 (50%)
Diabetes, n (%)		9 (25%)
Recent Imaging, n (%)	XR	2 (5.6%)
	MRI	11 (30.6%)
Prior surgery, n (%)		6 (16.7%)
Pain duration, n (%)	<6 weeks	2 (5.6%)
	6 weeks to 1 year	6 (16.7%)
	>1 year	28 (77.8%)
PROMIS10 Initial T Score (mean ± SD)	Mental Health (n=36)	45.5±6.6
	Physical Health (n=36)	39.8±7.0
Fair/Poor Initial PROMIS, n (%)	Mental (T<40)	7 (19.4%)
	Physical (T<42)	18 (50.0%)
Positive PHQ-2 Initial Screen, n (%)		5 (13.9%)
NPRS initial (mean ± SD)		5.5±1.8
Mild (1-3)	n (%)	6 (16.7%)
Moderate (4-6)	n (%)	19 (52.8%)
Severe (7-10)	n (%)	11 (30.6%)

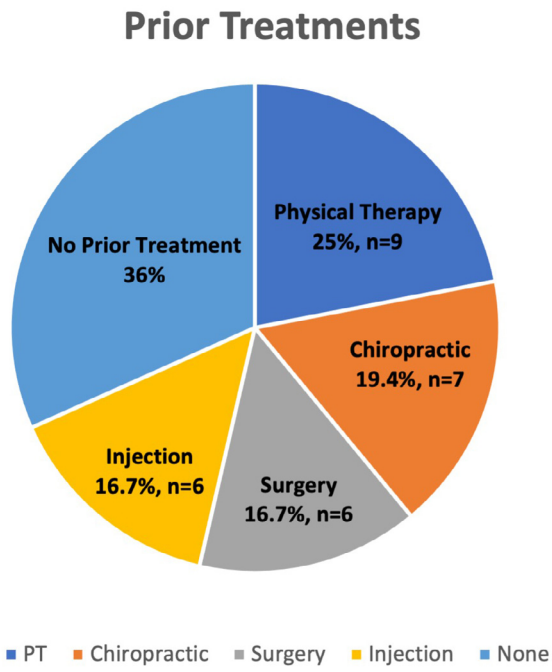

Fig 2 Previous treatments of patient group.

membership and time was significant, chi-square (1, N=67) =2.8, *P*=.0472. On an individual level, 1 patient lowered categories from Good/Excellent to Fair/Poor though pain had improved to zero, it was noted that they did not complete their final post discharge survey (fig 7).

Discussion

We sought to determine the effect a fully virtual ICT would have on pain and HRQoL in a population with LBP, while also examining the rates of imaging, prescription use, injections, and surgeries.

Our results suggest that an ICT model can be feasibly delivered through real-time audio-visual methods and may improve patients with LBP. CLBP patients (>12 weeks of pain) composed most (94.6%) of our patient population in this study and for >80% (n=30) pain was moderate to severe in intensity. Of these patients 83.3% (n=25) including 78.9% (n=15) of moderate and 90.9% (n=10) of severe) improved past the minimal clinically important difference for NPRS, which is associated with a satisfied result on patient global impression of change in CLBP.27 Furthermore, we found improvements in HRQoL, with categorical shifts in both PROMIS10 MH & PH scores from Fair/Poor to Good/Excellent over time.

Examination of PROMIS10 scores showed a PROMIS-MH change of 3.4 (*P*=.0293) and PROMIS-PH change of 4.7 (*P*=.0122); these changes are comparable with those obtained through a 12-week interdisciplinary pain program for CLBP, where PROMIS-MH improved by 2.1 and PROMIS-PH improved by 5.21

In our model, musculoskeletal physicians are the initial touchpoint for LBP patient evaluation, able to diagnose, educate, and prescribe. Our group obtained radiographs in 2.8%, whereas 16.3% of patients obtained radiographs from primary care in a large meta-analysis.[38] Recent work has identified that fear of negative consequences, low counseling time, and lack of access to appropriate practitioners act as barriers to following evidence-based imaging guidelines in primary care physicians treating LBP.[39] Built into our model is access to health coaching, physical therapy, and other ancillary needs which may be helpful to provide care, potentially lessening the impetus for imaging.

Up to 56% of CLBP patients are treated with opioids, and in a large representative American sample, 36.9% took at least 1 prescription medication.[40,41] No patients in our sample were prescribed opioids, and overall prescription use was low (16.2%). Medications used were limited to short burst oral steroids or short use oral NSAIDs,

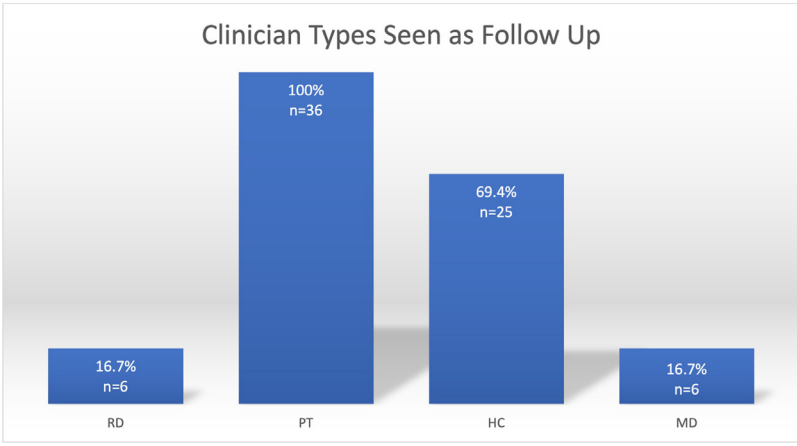

Fig 3 Follow-up care undertaken by patient group (RD, registered dietician; PT, physical therapist; HC, health coach; MD, MD or DO).

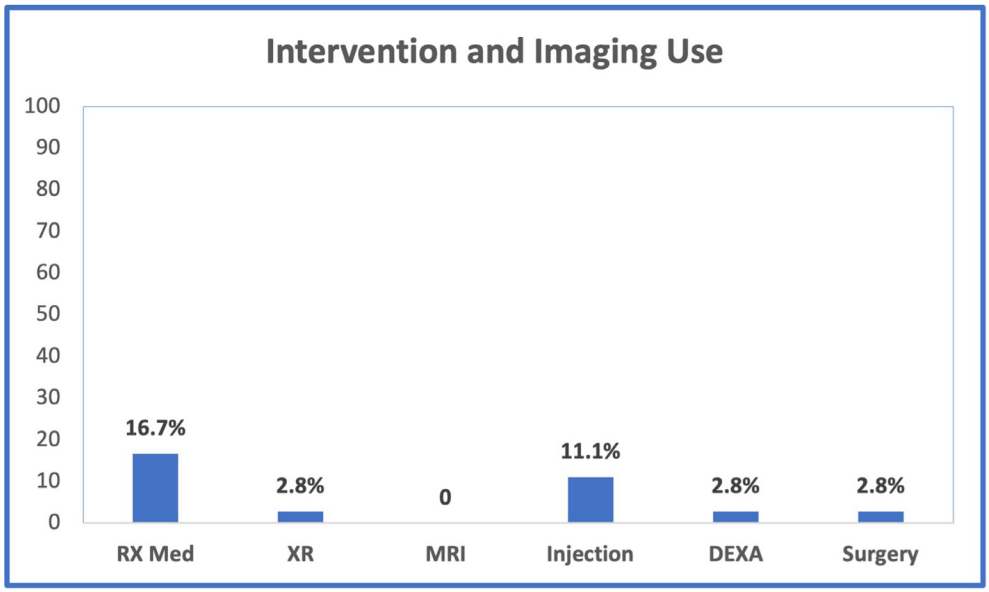

Fig 4 Medication, imaging, injection and surgical use of patient group using fully virtual real time audiovisual care.

with 1 initiation of bisphosphonate therapy for newly identified osteoporosis.

Study limitations

PROMIS-10 scales and NPRS are often delivered asynchronously as we are a fully virtual practice. This resulted in the absence of 5 NPRS readings at the 30-day timepoint, 1 patient with no PROMIS scales completed, and 3 final PROMIS scales unobtained. These individual situations were examined and did not appear to affect either NPRS improvement or PROMIS changes overall. Our study is also limited by potential selection bias, given that United States law prohibits the prescription of opioid medications without in person visits; those in greatest pain may self-select toward traditional encounters. Despite this potential selection bias, our population had a significant composition of patients with moderate to severe pain, with over 83% responding clinically to our interventions. Finally, given the observational retrospective nature of this study, without the use of multivariate

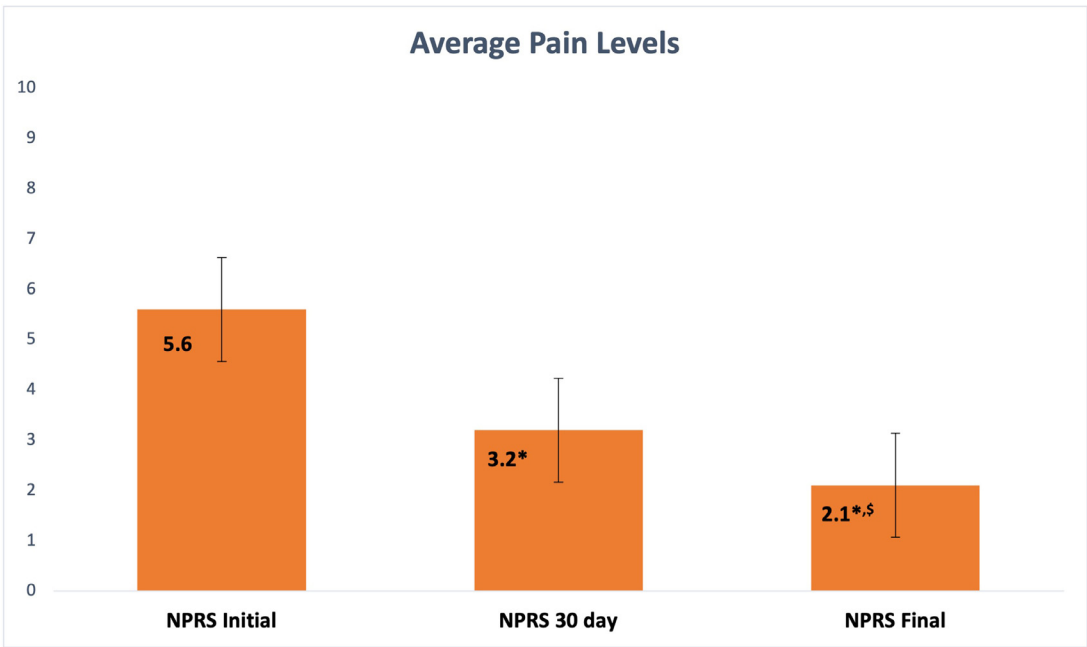

Fig 5 Average NPRS pain levels at start, 30 days, and final. *Statistically significant compared with initial. $Statistically significant compared with 30 day.

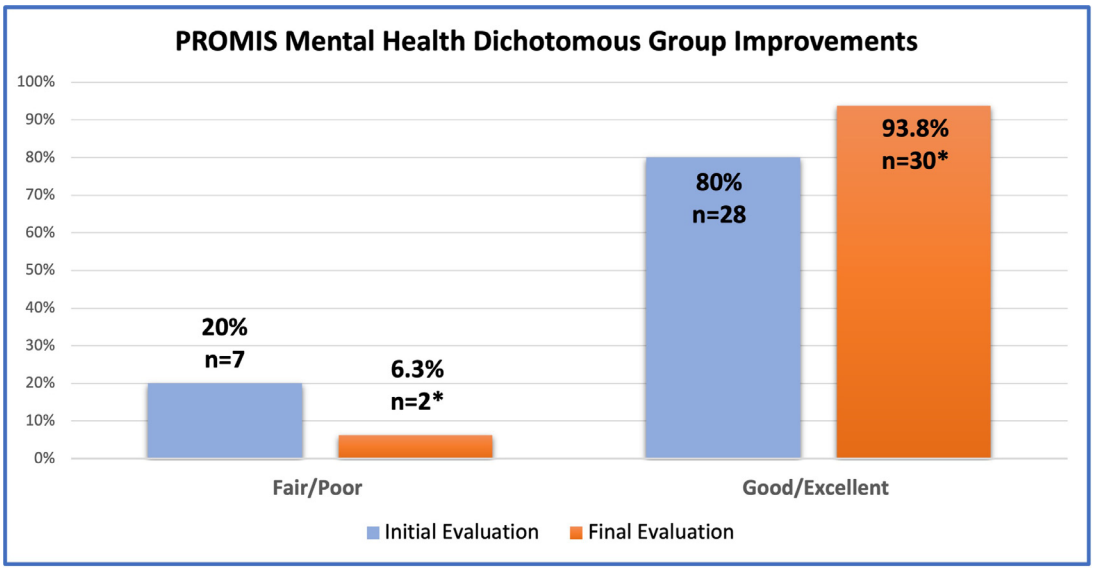

Fig 6 Improved PROMIS-MH patient categorization over time. *$P<.05$. More patients had Good/Excellent scores at finish compared with start. Three patients falling into the Good/Excellent category at start did not complete a final PROMIS10.

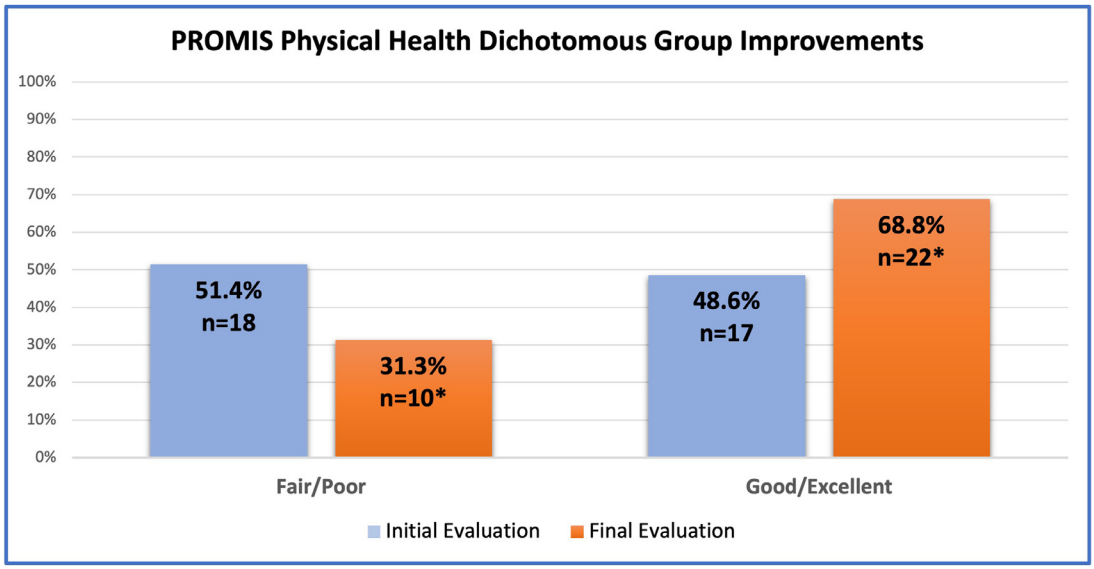

Fig 7 Improved PROMIS-PH patient categorization over time. More patients had Good/Excellent scores at finish compared with start. *$P<.05$. Two of 3 patients who did not complete final PROMIS10 started in the Good/Excellent category.

analysis in a larger sample size, a high risk of confounding bias exists.

Conclusions

A virtually delivered multidisciplinary musculoskeletal telemedicine practice may significantly improve pain and HRQoL in patients with LBP, while supporting low rates of imaging, prescription, and interventional use. Our experience supports further investigation of our model in a larger population with LBP through a randomized setting. Future work is needed to assess the effect health coaching and nutritional care may provide on the subpopulation of CLBP patients with comorbid obesity and depressive symptoms.

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