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Pain Rehabilitation's Dual Power: Treatment for Chronic Pain and Prevention of Opioid-Related Risks

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The purpose of this article is to provide a data-driven exploration of an interdisciplinary pain rehabilitation program (PRP) as a viable option for addressing the dual crises of chronic pain and opioid use. Psychologists are crucial providers in the PRP, in both intervention and leadership roles. There is well-established literature supporting pain rehabilitation as an effective treatment for chronic pain and functioning, but there are few studies examining the effects of pain rehabilitation on opioid misuse risk. We evaluated data from 60 patients with diverse chronic pain conditions who completed an interdisciplinary PRP to evaluate changes in pain, functioning (self-report and objective physical measure), psychological symptoms, and health-related quality of life. To evaluate the effect of pain rehabilitation on opioid-related risks, we examined opioid use and opioid misuse behaviors (measured by the Current Opioid Misuse Measure; COMM) pre- and posttreatment. Results demonstrated statistically significant improvements in all outcomes, with medium effect sizes for pain severity and large effect sizes for functioning, psychological symptoms, and emotional quality of life. Fifty-eight percent of patients were on opioid medications at entry compared with 15% at discharge. Among patients who entered on opioids, mean COMM scores were significantly reduced from above the cutoff for misuse risk ($M = 13.57$) to below the cutoff ($M = 5.86$). Overall, this study provided strong support for pain rehabilitation as an effective treatment for chronic pain and related suffering, while also providing a prevention-based opportunity for reducing opioid-related risk.

Public Significance Statement
This study supports the dual power of multidisciplinary pain rehabilitation as a viable intervention to address the dual crises of chronic pain and opioid-related risks. Additionally, it highlights the key role of health psychologists on pain rehabilitation teams.

Keywords: pain rehabilitation, chronic pain, opioids

Chronic pain (daily pain for ≥3 months) is a public health crisis that affects 25.3 million adults in the United States (11.2%; Nahin, 2015). The costs of chronic pain in both health care utilization and lost productivity top 635 billion dollars annually (Gaskin & Richard, 2012). Although this number provides a high-level view of the financial burden this condition carries, it does not reflect the immense burden on individual lives. Chronic pain is a multidimensional

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problem with biopsychosocial components and is associated with significant negative impacts on mental health, employment status, sleep, and social and family functioning (Dueñas, Ojeda, Salazar, Mico, & Failde, 2016; McCarberg, Nicholson, Todd, Palmer, & Penles, 2008). In fact, chronic pain has been found to negatively affect quality of life (QOL) more than other medical conditions, including cancer (Løyland, Miaskowski, Paul, Dahl, & Rustøen, 2010; Xiao et al., 2016). A new classification termed "high impact chronic pain" describes those with significant life interference because of pain that occurs most or every day (Interagency Pain Research Coordinating Committee, 2016). Recent data on high impact pain suggests it affects nearly five percent of the U.S. adult population (Pitcher, Von Korff, Bushnell, & Porter, 2019).

The opioid epidemic in the United States is also a massive public health concern associated with unprecedented rates of fatal overdoses, many of which are attributable to prescription opioid analgesics (Centers for Disease Control and Prevention [CDC], 2017; Vadivelu, Kai, Kodumudi, Sramcik, & Kaye, 2018). Reducing human suffering related to chronic pain and reducing potentially devastating risks related to opioid use via evidence-based interventions and clinical best practices, has been made a top priority by the U.S. Federal Government (Human Health and Services [HHS], 2019). Pain rehabilitation programs provide one modality for integrating evidence-based interdisciplinary and multimodal interventions, informed by a biopsychosocial understanding of chronic pain and opioid use. These programs focus on improving function related to pain, and some programs also focus on reducing or discontinuing opioid medication use. Psychologists, who are trained with a strong foundation in the biopsychosocial model, are uniquely suited to play a key role on the interdisciplinary pain rehabilitation team to address these two interwoven public health crises.

Chronic Pain and Opioids

In the 1990s, the American Pain Society (APS) began to encourage medical providers to treat pain as a "fifth vital sign," and the Joint Commission began requiring hospitals to assess all patients' pain (Baker, 2017). Meanwhile, pharmaceutical companies developed a new generation of more potent, extended-release opioid analgesics that were touted to be less addictive, following publication of lower quality, case series data that reported the risk of addiction with prescription opioids to be low (Porter & Jick, 1980). During this period, dramatic increases in opioid prescribing practices were observed and persisted over three decades (CDC, 2017).

Opioid therapy has been found to be effective for alleviating pain in the short-term, compared with placebo (Furlan, Sandoval, Mailis-Gagnon, & Tunks, 2006); however, there is virtually no research on long-term efficacy of opioids for chronic pain (Chou et al., 2015). There are known risks of opioid therapy, ranging from bothersome side effects—most commonly, constipation, nausea, dizziness, and drowsiness (Furlan et al., 2006)—to unintentional overdose and death. Long-term side effects are most concerning, including opioid-induced hyperalgesia, wherein opioids may exacerbate the painful condition they are intended to treat, which can also be complicated by opioid tolerance (Roeckel, Le Coz, Gavériaux-Ruff, & Simonin, 2016). Chronic opioid use may even shift the source of pain from the original source (e.g., injury; tissue damage) to the central nervous system (central sensitization), making treatment significantly more complicated (Rivat & Ballantyne, 2016). Opioid use has been associated with disability (Ashworth, Green, Dunn, & Jordan, 2013), lower QOL (Eriksen, Sjøgren, Bruera, Ekholm, & Rasmussen, 2006), and increased risk of bone fractures (Li, Setoguchi, Cabral, & Jick, 2013a; Saunders et al., 2010), myocardial infarction (Li, Setoguchi, Cabral, & Jick, 2013b), and motor vehicle accidents (Gomes et al., 2013).

Opioid use disorder (OUD) and unintentional overdoses are among the most serious potential consequences of opioid therapy for chronic pain. For some individuals taking chronic opioids for pain, OUD can become a distinct chronic medical condition (Speed, Parekh, Coe, & Antoine, 2018). Opioid therapy for ≥90 days after an initial chronic pain diagnosis has been associated with increased risk of OUD (Edlund et al., 2014), with a 35% estimated lifetime prevalence of OUD among patients with chronic pain (Boscarino et al., 2011). It has been suggested that chronic pain and associated emotional distress increases susceptibility to



Sharlene Wedin

OUD by dysregulating the brain's reward and stress circuitry (Garland, Froeliger, Zeidan, Partin, & Howard, 2013). Other known risk factors for OUD among chronic pain patients include high daily dose (>100 Morphine Milligram Equivalent [MME]), long term use of opioids, depression, and other substance use disorders (SUDs; Volkow & McLellan, 2016). Most concerning, prescription opioid use is associated with a dose-dependent, increased risk for overdose events and drug-related death (Dunn et al., 2010; Gomes et al., 2011). Opioid overdoses have been cited as a significant driver of the unprecedented decrease in life expectancy among Americans (Dowell, Arias, et al., 2017).

Further complicating the landscape is the "gray area" between physiological opioid dependence and overt SUD, as a diagnostic distinction between the two is often challenging or impossible (Manhapra, Arias, & Ballantyne, 2018). OUD is a condition that must be addressed, and considerable high-quality literature exists to guide clinicians in mortality-reducing, evidence-based treatment approaches (the details of which are outside the scope of this article). However, for patients with chronic pain who are physiologically dependent on opioids, but who do not necessarily meet criteria for addiction, there are no clearly delineated evidence-based treatment options to guide patients or clinicians. Providers have been encouraged to use nonopioid analgesics, recommend nonpharmacological treatments for chronic pain, and initiate opioid tapering and eventual cessation among patients taking opioids that are ineffective and/or above the specified safe limits (Dowell, Haegerich, & Chou, 2016). However, clinical challenges exist in tapering those physically dependent on opioids.

It is known that many patients on chronic prescription opioids are interested in opioid tapering (Frank et al., 2017). In fact, one study found that nearly half of those on high-dose prescription opioids reported a desire to cut down or stop; however, approximately 80% were still receiving high-dose opioids 1 year later (Thielke et al., 2014). In clinical practice, the most common patient fears preventing tapering of chronic opioids are fear of pain and fear of withdrawal. Because of these fears and lack of evidence-based guidance, opioid tapering can be challenging for both patients and clinicians, and in practice, discontinuation of chronic opioids is uncommon (8–35%; Frank et al., 2017). Therefore, many patients stay "stuck" on a medication that may be no longer providing adequate pain relief and contributing to risk and/or harm.

Worse, as the United States health care system reevaluates its relationship with opioid medications, there has been an increase in opioid tapers (both voluntary and involuntary) without adequate alternatives for pain management, which can exacerbate poorly controlled pain, cause psychiatric instability, and incite opioid misuse (Manhapra et al., 2018). This clinical decompensation can resemble addiction (e.g., running out of medication early; Dowell, Haegerich, & Chou, 2019). In the face of medicolegal fears, some prescribing clinicians have abruptly "abandoned" patients or practices, leaving many patients with poorly controlled pain and no exit plan (Pergolizzi, Varrassi, Paladini, & LeQuang, 2019). Thus, some have understandably voiced concern that the pendulum of correction may be swinging too far and too quickly (Baker, 2017).

Reviewing the costs and benefits together, it is clear that significant efforts are needed to alleviate the burden of prescription opioids. However, it is also important that these efforts do not leave patients stranded with poorly managed pain and withdrawal. Thus, the monumental challenge in the field is to develop strategies to both mitigate risks associated with chronic opioid therapy, while also effectively treating chronic pain and its detrimental effects on individuals' lives. Interdisciplinary pain rehabilitation programs offer a viable option for this dual target.

Pain Rehabilitation Programs

Meta-analyses have established pain rehabilitation programs as an effective treatment option for reducing chronic pain and associated disability (Bujak, Regan, Beattie, & Harrington, 2019; Kamper et al., 2015; Semrau et al., 2015). Multidisciplinary pain management programs were available as early as the 1950s, when Dr. John J. Bonica opened the first multidisciplinary pain clinic to improve functional outcomes for patients with chronic pain (Tompkins, Hobelmann, & Compton, 2017). Later, in 1980, Mayer and Gatchel developed a "Functional Restoration Program" that integrated physical conditioning and cognitive–behavioral



Rebecca L. Kilpatrick

approaches and was quickly replicated by other programs (Chen, 2006). These early, interdisciplinary programs began demonstrating solid efficacy for reducing disability and improving pain, as compared with standalone treatments (e.g., medication management, physical therapy) or usual medical care (e.g., Mayer et al., 1987; Roberts, Sternbach, & Polich, 1993). Although the programs were heterogeneous, common guidelines regarding what constitutes pain rehabilitation were eventually established: the team must be interdisciplinary and colocated; assessment and treatment options are comprehensive and include medical management, cognitive–behavioral treatments, physical therapy, and occupational therapy; and the team should share a common philosophy of pain rehabilitation (Gatchel, McGeary, McGeary, & Lippe, 2014).

Despite evidence of their effectiveness, a sharp decline in the number of pain rehabilitation programs was observed beginning in the 1990s (Stanos, 2012). This has been attributed to the increase in interventional and opioid-focused clinics, as well as economic factors—namely, decreased reimbursement. Only in the past 10–15 years, in light of growing concern about opioid therapy for chronic pain, has there been a renewed interest in developing and operating multidisciplinary pain rehabilitation programs that align with a biopsychosocial model and provide an evidence-based alternative to opioid treatment (Schatman, 2015).

A growing body of literature continues to demonstrate that pain rehabilitation programs improve physical functioning, pain severity, and mood among patients with chronic pain (Bailey, Kurklinsky, Sletten, & Osborne, 2018; Hooten, Townsend, Sletten, Bruce, & Rome, 2007), along with a significant reduction in medical costs (Sletten, Kurklinsky, Chinburapa, & Ghazi, 2015). A recent systematic review of a total of 3,370 patients found that interdisciplinary, intensive outpatient pain rehabilitation programs contributed to clinical improvements in pain, mood, pain catastrophizing, and QOL, with large effect sizes (Bujak et al., 2019). Impressively, there is even evidence that improvements in functioning are sustained up to 13 years later (Patrick, Altmaier, & Found, 2004). The efficacy of these programs is not surprising, as they combine several patient-centered, evidence-based treatment modalities that are known to improve chronic pain and functioning, including physical therapy, occupational therapy, and cognitive–behavioral therapy, and appropriate medical management. Each of these interventions has been included in the Department of Health and Human Service's Best Practices guidelines for pain management (HHS, 2019). Further, through daily participation in an intensive, group-based modality of treatment, patients engage in behavioral activation, which is an effective treatment for both chronic pain and depression (Kim, Crouch, & Olatunji, 2017), as well as daily social interaction and physical activity.

While the literature supporting pain rehabilitation is striking, there is limited research evaluating opioid tapering within pain rehabilitation programs or with inclusion of opioid-related risks as an outcome. There are some important studies that have supported significant, positive outcomes of pain rehabilitation even among patients who discontinue opioids during the program. One study found that patients entering pain rehabilitation on opioids reported higher levels of pain and depression upon entry, but all patients demonstrated significant improvements in pain, functioning, and mood at discharge and 6-month follow-up, regardless of opioid status at admission (Townsend et al., 2008). Another study of a pain rehabilitation program within a Veterans Affairs hospital similarly found that cessation of opioids had no impact on positive treatment outcomes, with patients who tapered off opioids demonstrating similar improvements in pain severity, functioning, negative affect, and coping (Murphy, Clark, & Banou, 2013). Further, a 12-month follow-up study of patients who tapered opioids within a pain rehabilitation program found that nearly 80% of patients remained off opioids 1 year after treatment, suggesting that these changes can be maintained over the long-term (Huffman, Sweis, Gase, Scheman, & Covington, 2013).

Study Aims

The Pain Rehabilitation Program (PRP) at the Medical University of South Carolina (MUSC) was opened in 2018 as part of South Carolina's multipronged efforts to address the dual crises of chronic pain and prescription opioid overdoses. The aim of the study is to evaluate the outcomes of the PRP at MUSC to determine whether this model is an



Lillian Christon

effective option for improving functioning for individuals with chronic pain while concurrently reducing risks related to opioid use. Specifically, pain severity, functioning (including self-report and objective physical measures), psychological symptoms, and health-related QOL were examined pre- and posttreatment. To further determine whether this model may offer an effective prevention model for opioid-related risks, an additional aim was to examine whether the program contributed to (a) reduction in opioid use and opioid misuse behaviors among patients who entered the program on opioids, and (b) reduction in known, modifiable risk factors for higher levels of chronic prescription opioid use, including depression (Sun, Darnall, Baker, & Mackey, 2016) and self-reported poor physical and mental health status (Bedene et al., 2019; Jerant, Agnoli, & Franks, 2020). We hypothesized that the program would contribute to significant improvements across all outcomes, replicating prior pain rehabilitation studies, and that there would also be significant reductions in opioid use, misuse, and risk to provide a new contribution to the literature.

Method

Program Description

This study analyzed data from patients who completed the full MUSC PRP between January 2018 and October 2019. The MUSC PRP was modeled on the Mayo Clinic model of pain rehabilitation, which has been replicated at several sites and found to be effective (Kurklinsky, Perez, Lacayo, & Sletten, 2016; Sletten et al., 2015). The MUSC PRP is an intensive outpatient program consisting of fifteen 8-hr days over 3 weeks and integrates cognitive–behavioral therapies, physical therapy, occupational therapy, and medical management, including opioid tapering, in a group-based setting. The program uses a cohort model of admission, with the same patients beginning and ending the program together to enhance cohesion. The average number of patients per cohort in this sample was four. The PRP is housed in the MUSC Wellness Center, a community fitness center located on the main hospital campus, which contributes to a wellness-focused environment, while still being in close proximity to hospital services (e.g., pharmacy and emergency services).

Referral, initial assessments, and treatment planning. Patients either self-refer to the PRP or are referred by an internal or external medical provider. Patients have been recruited via marketing strategies including direct mailings and Internet-based advertising, though the majority of patients (>90%) have been referred by a medical provider. Approximately 34% of patients who have been referred have completed an initial evaluation. Most common reasons for not being evaluated after referral include inability to make successful contact with the patient (22%), patient unable to complete program because of logistical barriers (e.g., schedule, cost; 18%), patient deemed not medically appropriate for the program after initial phone screen (e.g., does not have chronic pain; awaiting surgery; 18%), and patient not interested in the program (15%).

Patients complete an initial psychosocial pain assessment with a health psychologist to assess impact of chronic pain on current functioning, the presence of co-occurring psychiatric conditions, and overall appropriateness for the program. Patients are informed that the program focuses on improving functioning and QOL, as opposed to eliminating pain, and individual goals are developed that are consistent with this focus. Exclusion factors for participation include declining to participate or inability to commit to treatment model, presence of severe psychiatric disorder that would prevent adequate participation in the program (e.g., active psychosis; severe depression that requires stabilization before participation), unwillingness to discontinue opioid medication(s) whereas in the program, disruptive or otherwise concerning behavior that is expected to interfere with participation or the treatment milieu.

If patients are deemed to be appropriate program candidates by the psychologist, they undergo a medical assessment for clearance to participate in the program, which includes a medical record review, medication review with a focus on polypharmacy, and history and physical exam with focus on a cardiac, orthopedic, and neurologic assessment and exercise clearance. Should any unstable diagnoses be uncovered during this initial exam (e.g., unstable angina, unstable orthopedic condition), patients are referred out for further evaluation and clearance. Co-occurring conditions are managed within the program if appropriate and feasible



Wendy Balliet

(e.g., mild hypertension not at goal, poor blood glucose control, and depression, insomnia). Once medically cleared, participants are scheduled to complete baseline physical therapy and occupational therapy assessments and a battery of self-report measures. Patients are provided with a patient agreement with expectations for participation and potential treatment-interfering behaviors that should be avoided. Coordination with both the referring provider and primary care provider is performed by the nursing team initially, throughout the program as necessary, and at discharge. All medication changes are communicated in the discharge summary.

Co-occurring SUD and opioid tapering. Opioid use behaviors, substance use disorder symptoms, and history of substance use disorder are first assessed by the psychologist. If patients are using opioids appropriately or deemed to be in the gray area between opioid dependence and addiction (i.e., demonstrating physiological dependence and some misuse behaviors), they are welcome to participate in the PRP, and the rationale for opioid tapering is explained by the psychologist. If patients are demonstrating an active SUD (opioid or otherwise), wherein the SUD is severe and requiring stabilization, and/or more prominent than pain, they are referred for substance use treatment before participation. For these patients, urine drug screens (UDS) are requested before participation to confirm abstinence and adherence to prescribed medications.

All referred patients are informed before their initial evaluation that opioid discontinuation is a required part of the program, so those on opioids choosing to enter the program are generally seeking assistance with desired opioid discontinuation. As this is a voluntary program, patients who wish to remain on opioids are provided with information on other resources that do not require opioid discontinuation (e.g., individual psychotherapy or physical therapy). On the other hand, some referred patients have been recommended or mandated by their prescriber to discontinue opioids. In these cases, if the patient is willing, the PRP can serve as a resource for receiving close therapeutic and medical support through an undesired opioid discontinuation. Although not the direct or intended purpose of this program, involuntary opioid discontinuations are increasing, and PRPs can provide patients facing this circumstance a civilized way to exit from opioids.

For all patients entering on opioids, a medication taper plan is created in collaboration with a medical provider dually boarded in internal medicine and psychiatry, with a goal to fully taper off opioids during the 3-week program. Shared decision-making is utilized during taper planning to promote self-efficacy and active engagement. If patients have scored above the cutoff for at-risk opioid use on the Current Opioid Misuse Measure, the medical provider also assesses the patient for OUD and assists with medication-related treatment planning. Medical providers are waivered to prescribe buprenorphine for opioid use disorder, so should mild or moderate opioid use disorder be present, patients can be stabilized within the program. During the program, nurses monitor vital signs and withdrawal symptoms daily using the Clinical Opiate Withdrawal Scale (COWS; Wesson & Ling, 2003), and progress and/or difficulties around the tapering process are shared with the team during morning rounds. The psychologist plays the primary role in addressing the psychological challenges of opioid tapering during rounds and psychology groups. Given the intensive outpatient nature of the program, patients maintain possession of their own medications. To confirm adherence to tapers, weekly pill counts and monitored medication disposals are utilized. If patients are not willing to adhere to these program components, UDSs are requested, though in practice, unwillingness to adhere is rare.

Daily experiences in PRP. Each day involves a series of groups and activities (see Table 1), with the ordering and structure of the programming designed to model appropriate activity pacing. Group psychology sessions are delivered by health psychologists and include a variety of topics, including chronic pain education (central sensitization, gate control theory, chronic vs. acute pain, and pain behaviors), activity pacing, relaxation skills, stress management, pain and relationships, grief and loss, and sleep hygiene, among many others. Approaches from Acceptance and Commitment Therapy (ACT) for chronic pain are emphasized, including values-based behavioral activation, mindfulness, cognitive defusion, and acceptance of chronic pain.

Disposal of unneeded medications, particularly opioid medications, is encouraged and formally integrated into group therapy with the psychologist. With a theme of "let-



Jeffrey Borckardt

ting go," patients are educated on the rationale for discontinuing certain medications and appropriately disposing of unused medications, and any fears or other psychological barriers to doing so are addressed. Then, as a group, patients visit the on-campus drug disposal receptacle with their own medications for disposal. The program utilizes several other unique campus resources to practice and apply new behaviors. Patients visit the MUSC Urban Farm and receive education about ergonomically adapted gardening techniques and health benefits of growing a garden, which reinforces prior psychoeducation from occupational therapy and psychology on body mechanics, nutrition, mindfulness, and values-based behavioral activation. Patients also engage in a visual arts project throughout their time in the program, led by the MUSC Arts in Healing Program, designed to reinforce emotional expression. The program ends with "Family Day" on Day 15, during which patients are encouraged to bring family members who receive education on chronic pain, pain rehabilitation, and adaptive roles they can play in supporting their loved one.

Measures

All measures were administered to patients at two time points: pre- and posttreatment. The preassessment occurred on patients' "Day 0" appointment, completed before the first day in the program (no longer than 30 days before beginning). The second assessment occurred on patients' discharge day (Day 15).

Pain and pain interference. The *Brief Pain Inventory Short Form* (BPI; Cleeland, 1991) was used to assess pain severity and pain interference. Respondents were asked to rate their worst (in past 24 hr), least (in past 24 hr), average, and current pain intensity on a scale of 0 (*no pain*) to 10 (*pain as bad as you can imagine*). Respondents then rated the degree to which pain has interfered in seven life areas (general activity, mood, walking ability, normal work, relations with other people, sleep, and enjoyment of life) in the past 24 hr. Pain interference was rated on a scale of 0 (*does not interfere*) to 10 (*completely interferes*). The BPI is a widely used, well-validated and reliable measure of pain and pain interference in many chronic pain populations (α = .80–.92; Cleeland, 1991; Tan, Jensen, Thornby, & Shanti, 2004). Internal consistency was high in the current sample (α = .93 at pre and α = .92 at post).

Physical functioning. Physical functioning was assessed using the *6-Minute Walk Test* (6MWT). The 6MWT measures the distance (in feet) that an individual can walk on a flat, hard surface in a period of six minutes and has been well-validated as a measure of functional exercise capacity across many chronic illnesses (American Thoracic Society [ATS; ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories; 2002]). Individuals were instructed to self-pace their intensity and stop to rest if needed. The 6MWT was supervised and

Table 1
Daily PRP Schedule

Time	Activity
7:30–8:00 a.m.	Check-in with nurses
8:00–9:00 a.m.	Rounds with interdisciplinary team
9:00–10:00 a.m.	Physical therapy group (strengthening)
10:00–11:00 a.m.	Behavioral medicine (psychology) group
11:00 a.m. to 12:00 p.m.	Occupational therapy group
12:00–1:00 p.m.	Lunch on own
1:00–2:00 p.m.	Behavioral medicine (psychology) group
10 min stretch break with PT	
2:00–3:00 p.m.	Behavioral medicine (psychology) group
3:00–3:45 p.m.	Physical therapy group (cardio conditioning)
3:45–4:00 p.m.	Wrap-up and review with nursing

Note. PRP = pain rehabilitation program; PT = physical therapist.



Kelly Barth

measured by the staff physical therapist and was conducted on an indoor, circular track.

Psychological functioning. The *Brief Symptom Inventory 18* (BSI 18; Derogatis, 2000) was used to assess psychological functioning. It is an 18-item, self-report measure that assesses the presence and severity of three psychological symptom categories: Somatization, Depression, and Anxiety. There is also a Global Severity Index that measures overall psychological distress. The BSI 18 has been validated for use in multiple physical and mental health populations (see review of psychometrics in Petrowski, Schmalbach, Jagla, Franke, & Brähler, 2018; $\alpha = .61–.94$ with majority of scales over .80). In the current sample, $\alpha = .90$ at pre and $\alpha = .87$ at post.

Health-related QOL. Health-related QOL was assessed using the *Short Form 12 Health Survey* (SF-12; Ware, Kosinski, & Keller, 1996). This instrument is comprised of 12 questions that measure eight domains of physical and mental health over the past 30 days. The first question of the SF-12 asks patients to self-rate their own health status on a 5-point Likert-type scale ranging from poor to excellent. Physical health domains of the scale include General Health, Physical Functioning, Role Functioning-Physical, and Body Pain. Mental health domains include Vitality, Social Functioning, Role Functioning-Emotional, and Mental Health. Raw scores are converted to *T* scores with the use of published age and sex-specific mean scores and standard deviations in the general population (Ware et al., 1996). Its use has been well-validated and normed among general and chronic pain populations ($\alpha > .70$ for both physical and mental health domains; Luo et al., 2003; Ware et al., 1996; Ware, Kosinski, Turner-Bowker, & Gandek, 2002). For the purpose of this study, the pretreatment administration followed standard instructions while the posttreatment administration asked for responses to be reflective of the past week rather than the past 30 days. This alteration was made to capture most recent functioning rather than capturing responses based on functioning before or at the beginning of the treatment program. In the current sample, internal consistency was adequate, $\alpha = .78$ at pre and $\alpha = .76$ at post.

Opioid use. Information on patients' opioid use was gathered via a combination of patient report and review of the South Carolina Prescription Drug Monitoring Program PDMP. At program entry, patients were categorized as either nonopioid users, chronic opioid users (daily use), or PRN opioids users (nondaily, as needed use). For chronic opioid users, a daily opioid morphine milligram equivalent (MME) was calculated. For PRN opioid users, average MME for the past 3 months was calculated. Participation in opioid taper was monitored by the clinical team during the program and weekly pill counts were utilized to confirm adherence. Opioid use at discharge was similarly categorized as no use, chronic use, or PRN use.

Risk for opioid misuse. The *Current Opioid Misuse Measure* (COMM; Butler et al., 2007) was used to assess risk for opioid misuse. The COMM is a self-report measure that consists of 17 items assessing the frequency of certain aberrant medication-related behaviors and known risk factors for opioid misuse over the past 30 days. Response options range from 0 (*never*) to 4 (*very often*). It is a widely used measure with demonstrated predictive validity and reliability among patients with chronic pain ($\alpha = .96$; Butler, Budman, Fanciullo, & Jamison, 2010; Butler et al., 2007). The original validation of the COMM suggested a cutoff score of 9 as indicative of opioid misuse risk. For the purpose of this study, the pretreatment administration of COMM followed standard instructions while the posttreatment administration asked for responses to be reflective of the past week rather than the past 30 days. This alteration was made to capture the most recent changes in responses to items rather than capturing responses based on functioning before or at the beginning of the program. In the current sample, internal consistency was adequate, $\alpha = .79$ at pre and $\alpha = .76$ at post.

Statistical Analyses

First, descriptive and univariate analyses were conducted to determine sample characteristics. Mean values were derived for repeated measures as a preliminary analysis for models of change over time. Differences in mean outcome scores from pretreatment to discharge were compared using two-way paired *t* tests. All categorical variables were compared using two-way chi-square tests. Given the large number of within-subject comparisons, a conservative level of

statistical significance, $p < .01$, was utilized to prevent against Type I errors. Effect sizes were calculated using Hedges' g_{rm}, a modified Cohen's d effect size that has been recommended as a preferable, less biased effect size for repeated measures, between-subjects designs (Cumming, 2012; Lakens, 2013). Hedges' g_{rm} is obtained by calculating a corrected Cohen's d_s using pooled standard deviation as a standardizer and correcting for bias based on sample size and correlation between pre- and postscores. Effect sizes are generally considered small at $d = 0.2$, medium at $d = 0.5$, and large at $d = 0.8$ (Cohen, 1988). All statistical analyses were performed using IBM SPSS Statistics, Version 25.

Results

Baseline Characteristics

There were 126 patients who were evaluated for the MUSC PRP and 77 individuals who met inclusion criteria and started the MUSC PRP. The sample of program completers, those included in study analyses ($N = 60$; 77.9%), was largely female (83.3%; $n = 50$). Mean age was 54.22 ($SD = 14.0$) and ranged from 18 to 79. The sample was comprised of 30.0% Blacks ($n = 18$), 66.7% Whites ($n = 40$), and 1% each Asians and Pacific Islanders ($n = 1$). 6.7% identified as Hispanic ($n = 4$). Primary medical diagnosis, based on patient self-report and confirmed by chart review where possible, included chronic back pain (46.7%), fibromyalgia (11.7%), chronic abdominal or flank pain (11.7%), arthritis (6.7%), neuropathy (5.0%), neck pain (5.0%), and other pain conditions (e.g., chronic regional pain syndrome, migraines, knee pain; 13.3%). Over half of patients ($n = 38$; 63%) also had at least one other pain-related diagnosis in addition to their primary diagnosis. At initial assessment, 91.7% of patients were diagnosed with at least one co-occurring mental health diagnosis. Over half the sample (53.3%) were diagnosed with a depressive disorder, 38.3% with an anxiety disorder, 30.0% with an adjustment disorder, and 3.3% with Bipolar disorder. Eighty-three percent of patients were prescribed at least one antidepressant. Nine patients (15%) were diagnosed with an opioid use disorder, with four of those patients (26.7%) already on maintenance therapy. Two of the patients diagnosed with OUD had a history of illicit opioid use in remission, whereas the remainder reported solely prescription opioid misuse. Six patients (10.0%) were diagnosed with a co-occurring alcohol use disorder.

There were 17 patients (22.1%) who started the MUSC PRP and did not complete the program and, thus, were not included in this study. Reasons for attrition included acute medical issue ($n = 6$), family emergency ($n = 5$), personal choice because of program-related issues ($n = 3$), dismissal because of noncompliance ($n = 1$), and unknown reason because of no contact ($n = 2$). Between program completers and noncompleters, there were no significant differences in gender, race, age, or opioid status at baseline ($p > .05$). There were also no significant differences on any of the pretreatment main outcomes, including pain severity on the BPI, psychological symptoms on the BSI-18, opioid misuse risk (COMM total score), mental or physical health QOL domains on the SF-12, or the 6MWT ($p > .05$). Of the completers, all patients completed the entirety of the baseline and discharge assessments, resulting in minimal missing data (<0.5%).

Pre- or Postoutcomes

Pain and pain interference. Table 2 displays pretreatment and discharge pain severity and average pain interference ratings from the BPI. Mean difference t tests showed significant reductions on all other BPI subscales as well, including pain at its worst in past 24 hr, $t(59) = 4.65$, $p < .001$, 95% confidence interval (CI) [0.92, 2.31], Hedges $g_{rm} = 0.74$, pain at its least in past 24 hr, $t(59) = 3.06$, $p < .01$, 95% CI [0.36, 1.74], Hedges $g_{rm} = 0.42$, and pain interference with general activity, $t(59) = 7.72$, $p < .001$, 95% CI [2.13, 3.63], Hedges $g_{rm} = 1.10$, mood, $t(59) = 7.01$, $p < .001$, 95% CI [2.07, 3.73], Hedges $g_{rm} = 1.05$, walking ability, $t(59) = 6.89$, $p < .001$, 95% CI [1.88, 3.42], Hedges $g_{rm} = 0.88$, normal work, $t(59) = 7.16$, $p < .001$, 95% CI [2.05, 3.64], Hedges $g_{rm} = 0.95$, relations with other people, $t(59) = 6.14$, $p < .001$, 95% CI [1.75, 3.44], Hedges $g_{rm} = 0.92$, sleep, $t(59) = 6.23$, $p < .001$, 95% CI [1.90, 3.70], Hedges $g_{rm} = 1.00$, and enjoyment of life, $t(59) = 7.03$, $p < .001$, 95% CI [2.35, 4.22], Hedges $g_{rm} = 1.22$.

Mood. Table 3 demonstrates pretreatment and discharge scores on the BSI-18, with significant reductions in all subscale scores.

Table 2
Pre- and Posttreatment Scores on the Brief Pain Inventory

	Pretreatment		Posttreatment				
Measure	*M*	*SD*	*M*	*SD*	*t*(59)	*p*	Hedges g_{rm}
Average pain rating	6.41	1.59	5.34	2.05	4.10	<.001	0.57
Average pain interference	6.05	2.31	3.44	2.29	8.14	<.001	1.14

Table 3
Pre- and Posttreatment Subscale Scores on the Brief Symptom Inventory

	Pretreatment		Posttreatment				
Measure	*M*	*SD*	*M*	*SD*	*t*(59)	*p*	Hedges g_{rm}
Anxiety	8.52	5.74	4.55	3.98	6.38	<.001	0.76
Depression	9.50	6.17	3.60	4.06	8.67	<.001	1.07
Somatization	8.60	4.46	5.87	4.16	4.72	<.001	0.63
Global distress	26.62	13.83	14.02	9.90	8.10	<.001	1.00

Quality of life. On the SF-12, mean *T* scores on the Emotional Health domain increased significantly from 35.01 (*SD* = 12.29) to 49.13 (*SD* = 013.07), $t(59) = -7.50$, $p < .001$, Hedges $g_{rm} = 1.10$, and mean *T* scores on the Physical Health domain increased significantly from 31.41 (*SD* = 7.45) to 35.54 (*SD* = 8.83), $t(59) = -3.25$, $p < .01$, Hedges $g_{rm} = 0.51$. In examining responses on the first item of this measure (answered by $n = 58$ patients on the preassessment and $n = 57$ patients on the postassessment), which asks patients to self-report their own general health status, the percentage of patients who reported their own health status as "poor" decreased from 20.0% ($n = 12$) at pretreatment to 1.7% ($n = 1$) at posttreatment. The percentage of patients who reported it as "good," "very good," or "excellent" increased from 32.8% ($n = 19$) to 63.2% ($n = 36$).

Physical functioning. Objective physical functioning as measured by the 6MWT increased from 1193.67 ft pretreatment to 1505.25 ft at discharge, $t(59) = -10.24$, $p < .001$, Hedges $g_{rm} = 0.85$. Clinically significant change, defined as a 50–100 ft increase, was demonstrated by 91.67% of patients.

Opioid use. Upon admission to the program, 56.7% of patients entered the program on at least one opioid medication ($n = 34$). Among patients who entered on opioids, 73.5% ($n = 25$) were using chronic, daily opioids, with an average daily MME of 39.40 (*SD* = 53.12); 23.5% were PRN, nondaily opioid users, with an average MME over the past 3 months of 15.58 (*SD* = 7.62); and one patient entered the program on a buprenorphine patch. Among those entered on opioids, 76.5% were on a low to moderate dose (MME <50) and 23.5% were on a moderate to high dose (MME >50). Comparing baseline differences between those who entered on opioids and those who did not, there were no significant differences in age, average pain severity, psychiatric symptoms on the BSI, or 6MWT. Those who entered on opioids reported high average pain interference on the BPI ($t(58) = -3.01$, $p < .01$).

At discharge, 88.3% of patients left without an opioid prescription or any remaining opioids (i.e., participated in medication disposal if relevant). Of the seven patients (11.7%) who did not leave opioid-free, all entered the program on opioids. Four of these patients were PRN, nondaily opioid users who did not require a taper but refused to participate in medication disposal, despite initial agreement. Of the two patients who left the program on chronic, daily opioid therapy, one entered on a high daily dose (270 MME) and was unable to fully taper but left the program on notably less (90 MME), and the other patient participated in a taper but then refilled and reinitiated their medication before completing the program. The remaining patient continued his or her buprenorphine patch at the same dose. Comparing patients who entered the program on opioids versus those who did not enter on opioids, there were no significant differences in pre–post change scores for pain ratings or interference, mood symptoms, QOL, or the 6MWT ($p > .05$), with all patients demonstrating significant improvements.

Opioid misuse risk. Among patients who entered the program on opioids ($n = 34$), mean scores on the COMM were significantly reduced from 13.57 (*SD* = 7.49) to 5.86 (*SD* = 4.04), $t(34) = 6.32$, $p < .001$, Hedges $g_{rm} = 1.01$. At preprogram, 71.4% of patients ($n = 25$) who entered on opioids were above the established cutoff (>9) for opioid misuse risk, compared with 34.3% ($n = 12$) at discharge.

Discussion

The chronic pain and opioid epidemics have placed a burden on health care providers, including psychologists, to find solutions to these massive public health concerns. One response is for prescribing providers to reduce opioid prescribing and utilization of long-term opioid therapy among patients with chronic pain. However, discontinuing opioids without appropriate support or adequate alternative treatment is a short-sighted solution that can cause more harm to patients than benefit. The current study supports the effectiveness of pain rehabilitation as a viable intervention to (a) reduce the risks associated with opioid therapy, while (b) effectively treating chronic pain and associated functioning and QOL.

Pain Rehabilitation Power #1: Treatment of Chronic Pain and Its Associated Costs

Patients who participated in the 3-week PRP reported significantly reduced physical pain, reduced pain interference with daily activities, improved QOL, and lowered

depression, anxiety, and somatic symptoms on self-report measures. Objective functional assessment using the 6MWT demonstrated clinically and statistically significant improvement in physical functioning from pretreatment to discharge. Effect sizes were medium for changes in pain severity and physical health QOL and large for changes in pain interference, mood, 6MWT, emotional QOL, and opioid misuse risk. Subjective and objective improvement in functioning suggests that pain rehabilitation may be an ideal approach for patients suffering from high-impact pain. In addition, patients' self-perceived health status showed meaningful improvement. As patients perceive themselves as having better health status, they may be less likely to seek additional medical treatments, relying more on self-management skills acquired in pain rehabilitation (Sletten et al., 2015). These findings add to the well-established literature supporting pain rehabilitation as an effective treatment option for patients with chronic pain. Improvements seen in this study are similar to findings from other pain rehabilitation programs and provide support that positive outcomes can be replicated across programs. Further, while predominantly female, the study sample was diverse in terms of race, age, and presenting chronic pain problem, which suggests that pain rehabilitation can be effective across the life span and for underserved patient populations.

Pain Rehabilitation Power #2: An Opioid Risk Prevention Model

Beyond improvements in pain and functioning, when considering the results and implications of the current study, pain rehabilitation may also serve as a multipronged prevention-based model for reducing the risks associated with opioid use among patients with chronic pain. This study is consistent with prior research (Murphy et al., 2013; Townsend et al., 2008) demonstrating that those who taper off opioids within pain rehabilitation show similar improvements compared with nonopioid patients. The majority of patients who entered the MUSC PRP on opioids left the program having fully tapered off their opioid medication. Opioid misuse risk, as measured by the COMM, was significantly reduced among patients who entered on opioids, with a large effect size. Patients are often fearful of discontinuing their pain medications because of expectation of increased pain, whereas a reduction in pain was observed, whether patients entered the program on opioids or not. Other reported barriers to opioid tapering include fear of withdrawal symptoms and pessimism about nonopioid treatments (Frank et al., 2017). Pain rehabilitation may help address these concerns by providing a supportive environment for tapering and learning effective nonmedication interventions (e.g., exercise) and coping strategies to utilize during the taper.

In considering a prevention model for opioid-related risks, pain rehabilitation may serve as **primary prevention** by providing an effective, evidence-based nonpharmacologic treatment to manage chronic pain in opioid-naïve patients. As pain rehabilitation provides education about effective alternatives to opioids use, it also ameliorates known risk factors for higher levels of chronic opioid use as well as misuse, including depressive symptoms, higher pain severity, and self-rated poor physical and mental health status (Bedene et al., 2019; Jerant et al., 2020; Sun et al., 2016), all of which were significantly reduced in the current study. When effective nonopioid treatment for chronic pain is provided early enough, it may effectively prevent initiation of opioids, though further research is needed to confirm this potential. Through the same channels, pain rehabilitation can also serve as **secondary prevention** by preventing misuse among patients who are not yet misusing or dependent on opioids and who discontinue their opioids while in the program. Finally, for patients living in the gray area between dependence and addiction, pain rehabilitation offers a **tertiary prevention** option in the form of an "exit plan" and opportunity to taper off opioids while being supported by a medical team and learning other skills for managing their pain.

The Role of the Psychologist in Pain Rehabilitation

The psychologist serves as a clinical leader for the interdisciplinary PRP team. The unique training of psychologists, particularly behavioral medicine psychologists, with a strong foundation in the biopsychosocial model, makes them ideally suited to play a key role on the pain rehabilitation team to address both chronic pain and opioid use. In this role, psychologists are in a position to deliver a "heavy dose" of evidence-based psychotherapy and psychoeducation about chronic pain, while also guiding the overall team's approach. Pain is a complex condition that requires a nuanced treatment approach combining a supportive and empathic milieu along with structure and accountability, particularly in the context of reducing opioid use. Psychologists have specialized skills to address the psychological components of withdrawal and tapering, including anxiety, fear of pain, and ambivalence about behavior change, which are often much less straightforward than physical withdrawal. Psychologists can guide patients in the development of both cognitive and behavioral strategies to help decrease reliance on medications and other medical interventions. In the MUSC PRP, ACT-based approaches are emphasized, with a focus on pursuing a more mindful and accepting attitude toward pain and pursuing values-based action rather than pain avoidance. Reviews have established ACT as an effective treatment for improving pain intensity, depression, anxiety, disability, QOL, and pain interference (Feliu-Soler

et al., 2018), and an RCT showed ACT to be as effective as traditional CBT, with higher levels of patient satisfaction (Wetherell et al., 2011). There is even evidence that pain acceptance may mediate the functional improvements observed in multidisciplinary pain rehabilitation programs (Åkerblom, Perrin, Rivano Fischer, & McCracken, 2015). In addition to psychological treatment, psychologists are trained to diagnose and treat mental health disorders that may present comorbidly in this population. Contributing factors such as history of trauma can be incorporated into the treatment approach as appropriate. Further, when encompassed within an interdisciplinary medical setting, psychologists may be able to reach patients who would not otherwise seek standalone psychological treatment for chronic pain. For these reasons, as pain rehabilitation treatments continue to "re-emerge" to address the dual crises of chronic pain and opioid use, it will be important to expand education and training in chronic pain and opioid use disorder for psychology graduate students and health psychology trainees to allow for psychologists to continue playing a key role on these teams.

Future Directions and Limitations

To our knowledge, this was the first study of pain rehabilitation that included opioid misuse risk as an outcome. It is possible that the observed reduction in opioid misuse risk, as measured by the COMM in this study, was simply a short-term product of the opioid taper, so more research is needed to evaluate the longer-term impacts of pain rehabilitation programs on prescription opioid use and risk outcomes. Of note, a fair proportion of individuals in this study (34%) were still above the established cut-off for opioid misuse risk after treatment, suggesting continued need for targeted interventions to reduce this risk beyond participation in PRP.

As evidence of pain rehabilitation grows, further research is needed to identify critical program components for meaningful improvement. Pain rehabilitation is time- and resource-intensive and, therefore, not a viable option for all patients with chronic pain. An important endeavor will be to identify options for adaptations of pain rehabilitation that are briefer or otherwise more accessible but still preserve pain rehabilitation's positive outcomes.

The results of this study should be interpreted in the context of certain limitations; most notably, the lack of a control group or long-term follow-up data. We are currently evaluating outcomes from a control group to compare to patients in the pain rehabilitation program. Still, as noted in other pain rehabilitation literature, each patient's pretreatment data can be considered a representation of their functioning after trying many conventional pain treatment options. Long-term follow-up data was not included in the current study because of the fairly new status of MUSC's PRP. Long-term outcomes have been previously published (Patrick et al., 2004; Townsend et al., 2008), and we are currently engaged in prospectively following our patients to assess pain severity, pain interference, QOL, and opioid usage over a 12-month period. Additionally, individuals with severe and/or unstable OUD were excluded from participation in the PRP, so results may not generalize to this population. More broadly, conclusions from this study are limited by its observational nature and possible selection bias, in that those who choose to participate in a pain rehabilitation program may have unknown, important differences from those who do not; thus, results may not generalize to all individuals with chronic pain.

Conclusion

The chronic pain and opioid public health crises are separate but inextricably linked and, therefore, require multipronged, coordinated efforts to be sufficiently addressed. Changing prescribing practices, that is, increasing opioid tapers and reducing new prescriptions, is not a sufficient approach on its own, and may in fact exacerbate suffering among patients with chronic pain who are left feeling "stuck." Based on findings in this study, pain rehabilitation should continue to be "rediscovered" as an evidence-based approach to treat pain and suffering, while also offering a prevention-based opportunity for reducing opioid-related risk.

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