TABLE:
Results of One-Way Repeated Measures ANOVA

Population	df	F	Sig.	Partial Eta Squared
Males R Hand	2.49, 725.21	87.68	p<.001	.23
Females R Hand	2.15, 670.21	47.49	p<.001	.13
Males L Hand	2.38, 692.99	37.08	p<.001	.11
Females L Hand	2.04, 636.56	20.74	p<.001	.06

Three Way Interaction: Age, Pinch Span/Level, Sex

Hand	df	F	Sig.	Partial Eta Squared
R Hand	14.22, 1400.65	.91	p=.552	.009
L Hand	13.53, 1332.74	.55	p=.551	.002

A non-significant three way interaction was noted bilaterally.

32

Rehabilitation Interventions for Acute Pain Management After Hand Injury or Surgery: An Evidence Synthesis Overview

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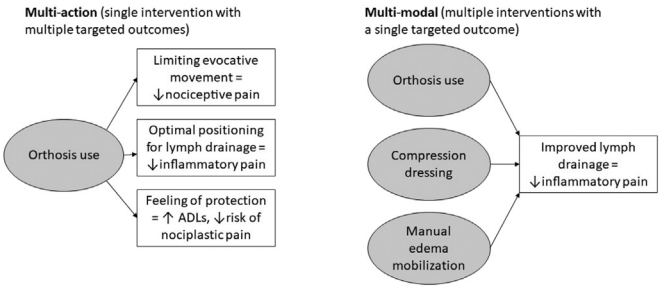
Purpose: Management of acute pain is an early goal in hand rehabilitation, where conditions include fractures, soft tissue trauma, and post-operative treatment of emergent injuries and planned surgeries. Effective pain management promotes rehabilitation participation, and develops therapeutic alliance. Occupational therapists and physiotherapists develop treatment plans using evidence, client presentation, preferences, and available resources. To inform these decisions, we undertook evidence synthesis to provide an overview of research evaluating available interventions.
Methods: We conducted a systematic literature search, data screening and extraction, quality appraisal and narrative synthesis of systematic reviews and randomized controlled trials (RCTs) addressing acute pain after hand or wrist injury.
Results: Thirteen systematic reviews and 16 RCTs met our inclusion criteria, reporting pain reduction or self-reported composite measures including pain appraisal (e.g. pain subscale of Patient-Rated Wrist Evaluation). Interventions were categorized as a) mobilization/ immobilization interventions (splinting, casting, exercise), b) non-prescription medications (e.g. NSAIDs, arnica, vitamin C) or c) modalities and supervised therapy (for example, thermal modalities). Even high quality reviews (our mode AMSTAR rating was 100%) generally contained low quality trials (our Jadad RCT mean rating of 2.1/5 was representative of the overall literature) with modest effects reflecting heterogeneity in intervention frequency and duration, and pain representation.
Conclusion: Therapists often combine multi-action and multi-modal approaches: there is little evidence to recommend any single management strategy for acute pain after hand injury or surgery. Future research to advance patient care would benefit from explicit linkages between an intervention's anticipated mechanism of action, and pain outcomes.



Multi-action vs. multi-modal approaches to pain management interventions

33

The Relationship Between Patient Reported Outcomes Measurement Information System (PROMIS) Measures With Therapy Referral And Utilization

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Purpose: Patients seeking treatment for an upper extremity condition are at risk for experiencing symptoms of depression, anxiety, and pain which limits functional abilities. These symptoms can negatively impact their treatment, and functional outcomes. A newly available series of measures, Patient Reported Outcomes Measurement Information System (PROMIS), have been previously validated to measures of depression, (Patient Health Questionnaire (PHQ-9)), anxiety (Generalized Anxiety Disorder (GAD-7)), and pain (Brief Pain Inventory). This study aims to examine the impact of patient reported symptoms of depression, anxiety, and pain interference at presentation to a hand surgeon on referral rates to hand therapy services and utilization of therapy services, using PROMIS measures.
Methods: This cross-sectional retrospective study analyzed electronic medical records of patients with at least one of seven common upper extremity diagnoses, treated at a tertiary orthopedic center. At each visit, patients were asked to complete PROMIS Depression, Anxiety, and Pain Interference measures preloaded on an IPad at each appointment with a hand surgeon. A data query and electronic medical record review provided data on demographics, ICD-10 diagnoses, PROMIS scores, and therapy referral for patient visits between April 2016 and November 2017. The number of therapy visits attended by a patient was obtained for a subsample of patients who attended therapy at the orthopedic center. All PROMIS scores were standardized to a general population distribution with a mean of 50 (SD: 10). Higher PROMIS scores indicate higher levels of the health domain (greater depression, anxiety, and pain). Descriptive statistics, Pearson chi-square and t-test analyses were performed to show differences in patient referral status to therapy.
Results: The sample of 351 patients is predominantly Caucasian (84.1%), female (59.5%), with an average age of 52.7 (±16.6) years. At baseline, 17.7% self-reported depression and 10.3% reported taking depression medications on intake questionnaires. Baseline PROMIS scores were close to the norm or lower for anxiety (51.7±11.0) and depression (46.4±10.3) but poorer for pain interference (60.5±7.4) modules. Forty-nine percent of patients were referred to hand therapy (n=172), though t-test analysis showed no difference in mean baseline PROMIS scores in all measures between patients referred and not referred. Overall, 11.0% of patients had PROMIS scores meeting or exceeding the clinically relevant threshold for depression (59.9) and 17.4% for

anxiety (62.3), while 56.1% of patients had pain interference scores more than one standard deviation above the population mean (60). Therapy referral rates did not differ significantly above and below these thresholds. Referral rates were 48.7% for those exceeding depression threshold, 47.5% for those exceeding anxiety threshold and 49.2% for those with high pain levels. Among those referred to therapy, 57.5% (n=96) were seen by a hand therapist at the orthopedic center. In this group, patients with high depression scores (above threshold) had an average of 3.7±5.9 therapy visits compared to those with lower depression scores (2.78±3.1 visits). Therapy visits were also greater for those with high anxiety scores versus low (4.14±5.0 visits versus 2.66±3.1visits). Patients reporting high pain interference scores had an average of 3.37±4.2 visits while those with lower scores had 2.31±2.2 visits. There was a range of 1 to 20 visits with a mean of 2.88.

Conclusion: These findings suggest that hand surgeons do not refer patients to therapy necessarily for high pain levels (measured by pain interference scores) nor presence of depression or anxiety as scored by PROMIS measures. However, patients with higher levels of depression, anxiety, and pain symptoms receive more hand therapy treatments, suggesting these patients require more support to achieve their treatment goals. Though physicians do not use mental health measures to determine need for referral, therapists can monitor mental health and pain using PROMIS measures to guide their language and use of empathy with individuals at greater risk for poorer clinical outcomes, and anticipate the need for greater number of patient visits to achieve maximal functional recovery. For those individuals meeting clinical threshold values of mental health and pain symptoms, the PROMIS measure may provide additional information to that which is provided on patient self-report intake questionnaires, in an easy to administer format. Future studies may shed light on the impact of providing support based on therapist monitoring of mental health and pain symptoms.

34

Occupation-Based Upper Extremity Rehabilitation: A Case Study

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Purpose: This case study quantifies and describes outcomes following occupation-based upper extremity (UE) rehabilitation for two patients with different UE conditions. Despite 85% of hand therapists being occupational therapists (OTs), biomechanical intervention and outcomes have predominated. Many OTs in this field have difficulty finding balance between using traditional biomechanical interventions to help improve physical function and focusing on occupation. A shift to occupation-based care focusing on functional performance is currently under way, returning to the foundation of the profession. Balancing both biomechanical and occupational interventions to optimize functional outcomes is exemplified in this case study.

Methods: Two patients (Pt. 1 and Pt. 2) seen spring 2019 in the Student Experiential Learning Hand Clinic (SELHC) at an Occupational Therapy (OT) program consented to use of their data for research. Pt. 1 is a middle-aged white female with left Complex Regional Pain Syndrome Type 2 following a healed, non-displaced distal radius fracture. She immobilized the injury but did not seek medical care until six weeks post-injury and was treated 1-2 times/week for a 10- week period. Pt. 2 is a middle-aged white female with a diagnosis of right adhesive capsulitis with a differential diagnosis of rotator cuff tendonitis or bursitis. Symptoms began two months prior to referral, with only home exercise program received prior to treatment in SELHC. She was treated 1-2 times/week for an 11-week period.

Care was provided by two second-year student therapists supervised by a third-year peer mentor and certified hand therapist. The percentage of time delivering interventions by type, as defined by the OT Practice Framework, was calculated for each session. Mock billing units were also assigned for each session. Outcome measures administered at initial evaluation, midpoint, and discharge were the Disability of Arm, Shoulder, and Hand (DASH), PROMIS Global Health (PROMIS), Patient Specific Function Scale (PSFS), Work Ability Score (WAS), average pain rated on a 10-point scale, goniometry and grip/lateral key pinch strength. Outcomes for baseline to midpoint are reported below. Progression of treatment is described in Figure 2.

Results: Both patients demonstrated meaningful clinical differences (MCID) in DASH scores ($\geq$10.83) from baseline to midpoint, indicating decline in disability. Pt. 2 also demonstrated MCID on Work DASH. Both patients achieved MCID ($\geq$2) from baseline to midpoint for composite functional scores based on priority activities identified with PSFS. Pt. 1 demonstrated an increase in PROMIS physical health score to within population norms by midpoint, and Pt. 2 remained within population norms for both physical and mental health. Both patients demonstrated an increase in WAS from baseline to midpoint, achieving a 7 (Pt. 1) and 4 (Pt. 2) point improvement.

Pt. 1 gained 44° active arc of motion (AARM) in wrist flexion/extension, 72° AARM in supination/pronation, and 3/4/2/1 cm (digits 2-5 respectively) in composite digit flexion to distal palmar crease by midpoint. Pt. 2 gained 131° AARM in shoulder flexion/extension, 32° AARM in shoulder abduction, and 6 vertebral-levels AARM in external rotation by midpoint. Pt. 1 gained 16 pounds grip strength and 6 pounds pinch strength, remaining below norms; however pinch strength was comparable to unimpaired extremity at midpoint. Pt. 1 reported a decrease of 4 points in pain, and Pt. 2 reported a decrease of 2 points. Improvement in both functional and biomechanical outcomes have continued to be observed.

Similar percentages for occupation/activity (26.6% and 29.1% respectively) and education/training (25.2% and 21.4% respectively) were noted for intervention type between patients. Intervention for Pt. 1 consisted of slightly more preparatory methods (23.7% vs. 18.5%) while intervention for Pt. 2 consisted of more preparatory exercise (32.5% vs. 20.2%). Most commonly used codes for mock billing data yielded greater billed therapeutic activities for Pt. 1 (40.9% vs. 22.5%) and greater billed therapeutic procedure for Pt. 2 (62.5% vs. 31.8%).

Conclusion: Improvements in both physical and functional performance achieved in this case study exemplifies the efficacy of utilizing occupation-based intervention in conjunction with biomechanical intervention. The two patients presented in this case study had different diagnoses and barriers, yet occupation-based intervention was successful with both. While potentially easier to administer with more time such as in a student-based clinic, the combination of biomechanical and occupation-based intervention is effective in addressing both physical and functional goals, and is a valuable addition to standard UE rehabilitation. Consistent with previous studies, this case study provides an example for clinicians of how biomechanical and occupation-based intervention approaches can intersect towards improving patient outcomes.