evidation

Pain Management Strategies and Activity Tracker Utilization in a Large-Scale Chronic Pain Study

Jennifer LA Tran, PharmD; Shefali Kumar, MPH; Raul Eulogio, BS; Ernesto Ramirez, PhD; Luca Foschini, PhD; Jessie L Juusola, PhD

Objectives

◆ Given the significant health burden of chronic pain and the valuable health insights that daily behavioral patterns can provide, we aimed to utilize self-reported survey data and behavioral data (e.g., step and sleep patterns from activity trackers) to better understand:
   ◇ Underlying causes of pain
   ◇ Functional impact of pain
   ◇ Behavioral indicators of breakthrough pain
◆ In this initial analysis, we explored the baseline prevalence of pain management strategies (including opioid use and digital health tools) and activity tracker use.

Methods

◆ Individuals with self-reported moderate to severe chronic pain (cohort 1) and those without chronic pain (cohort 2) were eligible to enroll in a currently ongoing, prospective, 1-year, virtual study.
◆ Enrolled participants completed daily and monthly surveys about their pain and overall health.
◆ Activity trackers and/or health/fitness apps could also be connected to the Achievement study platform in order to collect behavioral data for the study.
   ◇ Aggregated activity tracker data was utilized to assess differences in behavior between the two cohorts.
◆ We report baseline findings for all enrolled participants, and behavioral metrics from participants with ≥30 days of behavioral data for the 90-day period prior to enrollment.

Results

STUDY POPULATION

◆ 10,036 individuals enrolled into the study within a 9-month period.

Sample Baseline Characteristics	Chronic Pain (N = 5,832)	No Chronic Pain (N = 4,204)
Age, mean years (SD)	38.7 (10.7)	35.4 (9.8)
Female, n (%)	4,743 (81.3%)	2,650 (63.0%)
BMI, mean (SD)	32.0 (8.8)	30.1 (7.3)
QoL[a] [scale: 0-10], mean (SD)	6.3 (2.7)	8.5 (2.0)
PHQ-9[b] score, mean (SD)	11.9 (6.2)	6.3 (5.5)
GAD-7[c] score, mean (SD)	9.0 (6.0)	5.2 (5.0)

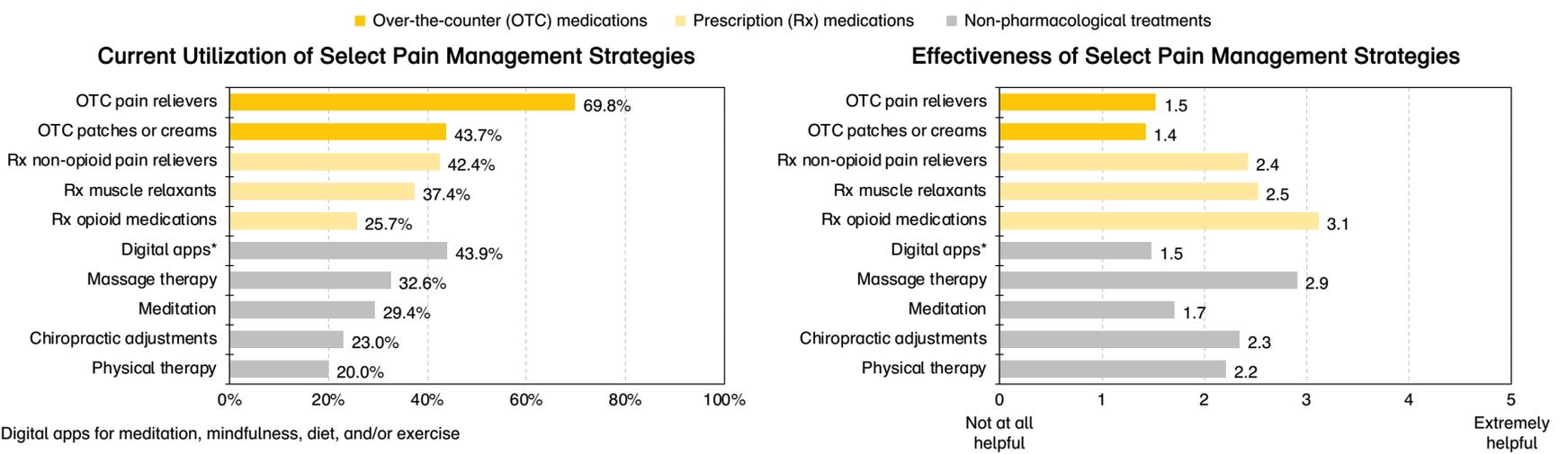| Comorbidities, n (%)	Chronic Pain (N = 5,832)	No Chronic Pain (N = 4,204)
Central nerve pain	445 (7.6%)	19 (0.5%)
Fibromyalgia	1,981 (34.0%)	102 (2.4%)
Migraine	3,603 (61.8%)	814 (19.4%)
Osteoarthritis	2,511 (43.1%)	441 (10.5%)
Peripheral nerve pain	1,519 (26.0%)	94 (2.2%)
Rheumatoid arthritis	698 (12.0%)	68 (1.6%)

[a] QoL is based on the American Chronic Pain Association Quality of Life Scale
[b] PHQ-9 = Patient Health Questionnaire 9-item Scale (depression)
[c] GAD-7 = Generalized Anxiety Disorder 7-item Scale

PAIN MANAGEMENT STRATEGIES

◆ Participants reported using a wide variety of pharmacological and non-pharmacological treatments for pain.

Legend: ■ Over-the-counter (OTC) medications ■ Prescription (Rx) medications ■ Non-pharmacological treatments

Current Utilization of Select Pain Management Strategies

Strategy	%
OTC pain relievers	69.8%
OTC patches or creams	43.7%
Rx non-opioid pain relievers	42.4%
Rx muscle relaxants	37.4%
Rx opioid medications	25.7%
Digital apps*	43.9%
Massage therapy	32.6%
Meditation	29.4%
Chiropractic adjustments	23.0%
Physical therapy	20.0%

*Digital apps for meditation, mindfulness, diet, and/or exercise

Effectiveness of Select Pain Management Strategies

Strategy	Rating
OTC pain relievers	1.5
OTC patches or creams	1.4
Rx non-opioid pain relievers	2.4
Rx muscle relaxants	2.5
Rx opioid medications	3.1
Digital apps*	1.5
Massage therapy	2.9
Meditation	1.7
Chiropractic adjustments	2.3
Physical therapy	2.2

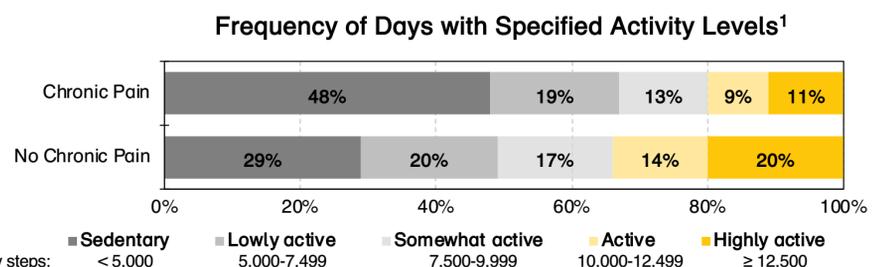(Scale: 0 Not at all helpful — 5 Extremely helpful)

BEHAVIORAL FINDINGS FROM ACTIVITY TRACKERS

◆ On average, participants with chronic pain had lower activity levels, spent more time in bed, and had higher resting heart rates compared to those without chronic pain as measured by passively collected activity tracker data and health/fitness apps.

Behavioral Data Features	Chronic Pain	No Chronic Pain
Steps per day, mean (SD)	6,392 (4,456)	8,594 (4,168)
Hours spent in bed per day, mean (SD)	6.8 (1.2)	6.7 (1.0)
Resting heart rate, mean bpm (SD)	76.1 (12.4)	71.7 (13.3)

*all p-values < 0.0001 based on non-parametric Mann-Whitney U test

Frequency of Days with Specified Activity Levels[1]

	Sedentary	Lowly active	Somewhat active	Active	Highly active
Chronic Pain	48%	19%	13%	9%	11%
No Chronic Pain	29%	20%	17%	14%	20%

Avg. daily steps: Sedentary < 5,000 Lowly active 5,000-7,499 Somewhat active 7,500-9,999 Active 10,000-12,499 Highly active ≥ 12,500

[1] Tudor-Locke C, et al. Med Sci Sports Exerc. 2009;41(7):1384-91.

Conclusions

◆ This large-scale study can provide significant insights about chronic pain and its overall management.
◆ Chronic pain is comorbid with a variety of health conditions. On average, individuals with chronic pain reported lower quality of life and more symptoms of depression and anxiety compared to those without chronic pain.
◆ Although OTC pain relievers were the most commonly utilized pain treatment, they were not highly effective in helping to manage pain. Opioid medications and massage therapy were rated as the two most effective treatment options.
◆ Step, sleep, and heart rate metrics from consumer activity trackers and health/fitness apps showed that, on average, individuals with chronic pain walked less, spent more time in bed, and had higher resting heart rates.
   ◇ These differences in activity levels may help to distinguish between individuals with and without chronic pain.
   ◇ These behavioral differences may also suggest worse overall health for individuals with chronic pain compared to those without pain.
◆ Additional analyses will explore the feasibility of developing digital biomarkers for pain and overall health.