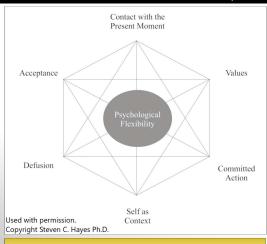# Acceptance and Commitment Therapy Delivered Via a Mobile Phone Messaging Robot Decreases Postoperative Opioid Utilization in Orthopedic Trauma Patients: Randomized Control Trial

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Contact with the Present Moment
Acceptance — Values
Psychological Flexibility
Defusion — Committed Action
Self as Context

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INTRODUCTION AND PURPOSE

- Public health concerns regarding opioid medications persist and healthcare systems are currently seeking solutions to the ongoing epidemic
- Additional small daily amounts as low as 10 morphine milliequivalents (MME), and every week of continued opioid utilization represent an increased risk of eventual opioid misuse by patients.
- Patient reported outcomes (PROs) are important tools for determining the efficacy of healthcare treatments, assessing clinical research, and allow patients to quantify their health in a standardized fashion.
- The National Institutes of Health developed the Patient-Reported Outcome Measure Information System (PROMIS) tools to advance PROs by creating question banks that could be used for many major health issues.
- Acceptance and Commitment Therapy (ACT) is a contextual cognitive behavioral therapy that employs a pragmatic approach to help individuals decrease suffering and live according to self-identified personal values.
- The goal of ACT is to augment an individual's psychological flexibility, thus improving their life according to six core processes: Acceptance, Defusion, Contact with the Present Moment, Self-as-Context, Values, and Committed Action.
- Electronic communication methods, such as automated mobile phone messaging, for healthcare purposes have become more preferred by patients for delivering and receiving medical information.
- The purpose of this investigation was to evaluate the effectiveness of ACT delivered via an automated mobile messaging robot on (1) decreasing early postoperative opioid utilization and (2) pain-related patient reported outcomes (PROs) in the first two weeks following surgery for acute, traumatic orthopaedic injuries.

METHODS

- Adults presenting to a university hospital level 1 trauma center indicated for operative fixation of a traumatic upper or lower fracture were considered and approached for the study.
- Individuals who had a personal mobile phone, and were familiar with mobile messaging were eligible.
- Patients were randomized in a 1:1 ratio to either the intervention group, who received twice-daily mobile phone messages communicating an ACT-based intervention for two weeks after surgery, or the control group, who received no messages.
- The ACT-base intervention was developed in collaboration with a pain psychologist specializing in ACT for treatment of chronic pain.
- Baseline PROs were completed by all subjects. Two weeks after operative intervention, follow-up was obtained in the form of an opioid medication pill count and postoperative administration of PROs.
- Mean number of opioid tablets utilized by patients were calculated and compared between groups. Mean PRO scores were also compared between groups.

RESULTS

- 82 subjects enrolled in the study, 6 dropped from the study due to various issues, and the final study population was 76 patients with 38 in both the ACT and Control groups.
- Analysis of all patient demographics collected demonstrated no differences between study groups.
- Average subject age was 45.5 and 48.7 years old for the ACT and Control groups respectively.
- No differences between groups were found for injury type, disposition following discharge, method for reporting opioid medication consumption, preoperative opioid medication prescriptions, or preoperative PRO scores.
- The intervention group utilized an average of 26.1±21.4 opioid tablets while the control group utilized 41.1±22.0 tablets, resulting in 36.5% less tablets utilized by subjects receiving the mobile phone-based ACT intervention.
- Intervention group subjects reported a lower postoperative PROMIS Pain Intensity score of 45.9±7.2 compared to the control group's 49.7±8.8.

Opioid pain medication utilization by group during two-week study period

	Opioid tablets dispensed			Opioid tablets consumed				Morphine milliequivalents consumed			
	ACT (N=38)	Control (N=38)	P-Value	ACT (N=38)	Control (N=38)	% Decrease	P-Value	ACT (N=38)	Control (N=38)	% Decrease	P-Value
Mean± SD	58.8± 27.3	61.6± 22.0	.62	26.2± 21.4	41.1± 22.0	36.5%	.004	199.9± 163.2	307.0± 166.0	34.9%	.006
Median (min-max)	60.0 (10-146)	60.0 (15-120)		21.0 (0-80)	43.5 (0-80)			157.5 (0-600)	307.5 (0-600)		

ACT: Acceptance and Commitment Therapy; Max: Maximum; Min: Minimum; SD: Standard deviation; %
Decrease calculated by the formula $\left(\frac{A-B}{A}\right) \times 100 = Percent\ Decrease$

Mean PROMIS score and change within two-week study period by study group

PROMIS Instrument	Preoperative score		Postoperative score		P-Value	Net score change		P-Value
	ACT	Control	ACT	Control		ACT	Control	
Pain Intensity 1A[a]	5.4±2.9 (0-10)	6.2 ±2.6 (1-10)	3.4±2.2 (0-9)	4.1±2.4 (1-9)	.22	-2.0±2.9 (-10-7)	-2.1±2.3 (-9-2)	.79
Pain Intensity 3A	54.9±7.3 (36.3-71.8)	57.1±8.2 (40.2-71.8)	45.9±7.2 (30.7-64.1)	49.7±8.8 (30.7-67.4)	.04	-9.0±8.5 (-25.5-10)	-7.4±7.7 (-23.9-6.1)	.38
Pain Interference 8A	63.6±11.4 (40.7-77)	66.1±8.4 (40.7-77.0)	56.6±9.4 (40.7-72.0)	60.6±8.2 (40.7-77.0)	.048	-7.1±13.7 (-36.3-24.8)	-5.4±10.4 (-26.2-19.5)	.55
Emotional Distress-Anxiety 8A	56.5±11.4 (37.1-80)	56.5±9.2 (37.1-76.7)	51.5±10.4 (37.1-75.4)	52.3±10.6 (37.1-76.7)	.76	-4.9±10.1 (-33.7-12.3)	-4.2±9.4 (-20.3-16.5)	.74

[a]Scores presented are raw numerical scores as no t-score conversion is available for the selected instrument.
Data presented as mean t-score± standard deviation (range); ACT: Acceptance and Commitment Therapy; PROMIS: Patient-reported outcome measures information system

MOBILE PHONE MESSAGE EXAMPLE

09:30 AM
Messages UIHC ACT Study Details

Welcome to this research study. Thank for your participation. If you need to talk with someone in our office, call this number. If you need urgent assistance call 911 or go to your local emergency room.

Maintaining focus on what you value most in life is sometimes difficult after surgery. Do not let the momentary discomforts due to surgery take away from what you want most in life. Pick 3 things that matter most to you in life. Remind yourself of these 3 things you value most during your recovery process.

Text Message — Send

CONCLUSIONS

- Delivering an ACT-based intervention via an automated mobile messaging robot in the acute postoperative period decreased opioid utilization in orthopaedic trauma patients in the first two weeks after their injury.
- Subjects in the ACT-based intervention group also reported lower pain intensity and pain interference after two weeks, though this likely did not represent a clinically important difference.
- Future studies may apply this intervention in other patient populations to assess its efficacy on a larger scale and may include assessment of pain and opioid use in a longer time frame after injury.

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