



## Research Article

# Pain Prevention Program: Background and Outcomes to Prevent Chronic Pain, Addiction and Disability with Transformative Care

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### Abstract

Pain Prevention Program (PPP) supports transformative care by integrating self-management training with treatment to improve long-term outcomes of pain conditions. The PPP includes patient engagement platform with personalized pain and risk assessment, digital training tools, telehealth coaching, and reimbursement strategies for easy integration into routine care to prevent chronic pain, addiction and disability. With research funding the National Institutes of Health, researchers and clinicians from University of Minnesota, HealthPartners Institute, and Minnesota Head and Neck Pain Clinic developed and tested the PPP therapeutic solution as a reimbursable solution to address the chronic pain and the opioid crisis. The overall goal is to provide a strategy for easy implementation of patient-centered care to prevent and decrease chronic pain, addiction and related disability or mental health conditions. This paper describes the rationale, background, characteristics, and research of a pain prevention program.

### Introduction

Chronic pain is the big elephant in the room of health care. It is the top reason people seek care, the #1 cause of disability and addiction, and the primary driver of healthcare utilization, costing more than cancer, heart disease, and diabetes [1-10]. The National Health Interview Survey (NHIS) found in 2016 that 126 million adults (55.7%) experienced a pain condition in the past year with 20.1% having daily pain and 31.8% experiencing severe pain [7]. In the United States, chronic pain accounts for over \$600 billion in healthcare costs. When pain conditions become chronic, it is associated with addiction, depression, missed work, disability, and intensive use of high-cost high-risk interventions including opioid analgesics, multiple medications, and surgery [7-12]. These problems exist because over 50% of the people with common pain conditions continue to have pain 5 years later despite treatment, because patient-centered risk factors in a person's life, that lead to

stress, strain, and chronic pain, are not addressed in routine care [13-18]. Patient-centered risk factors such as poor ergonomics, repetitive strain, prolonged sitting, stress, sleep disorders, anxiety, depression, abuse, and many others increase peripheral and central pain sensitization, leading to chronic pain and its consequences [13-22].

If usual care fails, clinicians and patients often escalate care to passive higher-risk interventions such as opioids, polypharmacy, surgery, or extensive medical and dental treatment instead of training patients to reduce the risk factors that continue to drive the pain condition [5-9]. Yet, clinical trials have shown that the long-term outcomes of these passive interventions are less compared to patient-centered approaches that activate and empower patients with self-management strategies such as cognitive behavioral therapy (CBT), therapeutic exercise, and mindfulness-based stress reduction to help patients lower risk factors for chronic pain and

addiction by implementing protective actions [11-40]. Thus, the National Institute of Medicine Committee on Advancing Pain Research, Care, and Education (2011) report on Relieving Pain in America states that health professionals' primary role for pain conditions should be guiding, coaching, and assisting patients with day-to-day self-care to reduce these risk factors.[1]. However, this is rarely done as health providers lack the time, training, tools, and reimbursement to guide patients in self-care. Healthcare providers need a strategy to provide consistent, regular, real-time support and training on self-care to their patients.

### **Preventing Addiction and the Opioid Crisis**

Chronic pain is often the primary reason to use opioids long-term leading to development of addiction to opioids and the current opioid crisis. According to the Centers for Disease Control (CDC), the most recent data estimates that 142 Americans die every day from a drug overdose. Since 1999, the number of deaths from prescription opioids has more than quadrupled and are now over 90,000 deaths per year, a greater number than from motor vehicle accidents and gun homicides combined [5]. From 2000-2021, there was alarming 800,000 deaths from opioid overdoses, with many under the age of 40 years. Most of these overdose deaths began with use of prescription opioids from physicians and dentists for pain conditions. In 2015, the number of opioids prescribed for pain conditions in the United States was enough for every American to be medicated around the clock for three weeks. Since the opioids are often blamed for this crisis, the solution many providers currently implement involves withdrawal and denial of the use opioids for pain conditions. However, as access to opioid prescriptions tightens, consumers in pain are increasingly turning to dangerous street opioids, including heroin and fentanyl. In 2015, 27 million people reported current use of illegal drugs or abuse of prescription drugs. According to the most recent National Survey on Drug Use and Health, only 10 percent of the nearly 21 million citizens with a substance use disorder (SUD) receive any type of specialty treatment for the pain or addiction. [5-6]. In addition, 40% of people with a substance use disorder also have a mental health problem such as depression, anxiety, and social conflicts. Less than half of these people receive treatment for these issues. The reasons for these treatment gaps are many, including the lack of strategies and readily available tools for health professionals to use prevent chronic pain and addiction.

### **National Initiatives Support Pain Prevention**

The Pain Prevention Program (PPP) Integrates self-management strategies with treatment to engage, educate and empower people in preventing chronic pain, opioid abuse, misuse, and overdose. This strategy is consistent with the core principles by most major healthcare organizations including the Institute of Medicine, the National Pain Strategy, the Institute for Health Care Improvement,

and the US Health and Human Services (USHHS) Strategy to combat the opioid crisis [1-6]. The PPP also addresses the Institute for Health Care Improvement's triple aim to improve the patient's experience of care, enhance the health of the patient, and controlling the cost of health care [40]. However, there are many barriers for health professionals to implement transformative care with self-management training. The lack of reimbursement, time burden, and inadequate training skills coupled with the lack of care coordination, fragmented care, poor communication, and conflicting treatments each interfere with patient-centered transformative approaches in clinical practice. The PPP was designed to overcome these barriers and support the health care system in shifting toward a transformative care approach.

### **Transformative Care: Integrating Training with Treatment**

PPP ([www.preventionprogram.com](http://www.preventionprogram.com)) and transformative care is a comprehensive therapeutic approach that is based on the Chronic Care Model (CCM) that designed to smoothly integrate self-management training with treatment of pain conditions (Table 1) [46-60]. The PPP uses each of the 12 CCM principles of implementing evidence-based self-management as part of routine patient care [53-54] : 1) brief targeted assessment, 2) evidence-based information to guide shared decision-making, 3) use of a nonjudgmental approach, (4) collaborative priority and goal setting, 5) collaborative problem solving, (6) self-management support by diverse providers including health coaches, 7) self-management interventions delivered by diverse formats, 8) patient self-efficacy measured and trained, 9) active follow-up, reminders, and reinforcement, 10) guideline-based case management for selected patients, 11) linkages to social support and community programs, and 12) multi-faceted interventions.

PPP includes digital pain and risk assessments; micro-lessons for therapeutic cognitive-behavioral self-management training; personalized action plans; telehealth coaching; remote telemedicine monitoring, billing, documentation and reimbursement strategies that can easily be integrated into a person's daily life and personalized to their individual characteristics (Figure 1). The program includes 3 tiers of lessons to provide immediate self-care relief, gradual healing of pain conditions by reducing the cause of the condition, and long-term recovery toward health and well-being. PPP also leverages the benefits of a support team including a telehealth coach, virtual reminders, and a social network for family, health care providers to enhance compliance and success. PPP tracks patient symptoms, life interference, adherence, and health care use and presents the data to patients, health coaches, and health professionals through a patient-centered outcomes dashboard to document the progress through the program, the resultant change over time, and present reminders and alerts when problems exist. Furthermore, since PPP is designed to be responsive to both smart

phones and computers, it can be implemented anywhere at any time to integrate into a person's daily lifestyle. It is also secure, confidential, transferable, and scalable as a cost-effective addition to a benefit package for employers, health plans, health systems, and health professionals.



### Technology support for the Pain Prevention Program

The PPP and core technologies include:

- **Pain Assessment:** Digitally delivered validated assessments review patients' signs, symptoms, pain severity, impact, functional status, past treatment, and current self-care to better understand a person's personal characteristics, risks, and outcomes associated with algorithms to identify specific chronic conditions and develop personalized care programs.
- **Risk Assessment:** Digitally delivered validated assessments reviews patient risk and protective factors in all areas of a patient's life, their readiness to change, and likely adherence to training. These innovative assessments were developed and tested for use by health coaches and health providers to better understand a person's personal characteristics, risks, and outcomes associated with a specific chronic condition and develop personalized care programs.
- **Telehealth Coaching:** Telehealth coaches are both trained in advanced education programs and nationally board-certified by the National Board of Health and Wellness Coaching ([www.NBHWC.org](http://www.NBHWC.org)) in health and wellness coaching in order to support patients in making needed changes to prevent pain and illness. They provide on-line telehealth visits to support the patients in making the lifestyle changes needed to recover from pain conditions, in addition to their medical and

rehabilitative interventions. Health coaching has been shown to improve outcomes (61-65). PPP leverages a supportive social network of family, friends, and health professionals to enhance motivation, understanding, and compliance, thereby improving long-term success.

- **Digital Patient Engagement Platform:** The digital platform can be licensed by individuals and health professionals using "software as a service" similar to electronic health record systems, except is focused on patient engagement. It integrates algorithms based on risk assessments to personalize self-management training of patients to reduce the causes of pain. It also documents outcomes with remote tracking for the provider and telehealth coach. The platform engages social support, allows for health coach documentation, and billing within a clinic setting to offer self-manage pain conditions. It also creates a virtual network of health care providers to document aggregate outcomes and allow for predictive analytics to improve long-term successful management.
- **Reimbursement Strategy:** The PPP platform provides a strategy for billing and documentation of CPT codes for health plan reimbursement by the clinic that implements the program with their patients.
- **Remote Monitoring Dashboard:** A HIPPA-compliant dashboard presents data to health coaches, healthcare providers, patients, and support teams to better understand the personal characteristics of patients and track their progress. The dashboard includes results of baseline assessment of each patient's personal characteristics, pain characteristics, current self-care, risk factors, protective actions, patient engagement, pain severity, and life interference. In addition, follow-up assessments provide detailed data on patient progress of both engagement in self-management as well as improvement in pain and functional interference.
- **Predictive Data Analytics:** Proprietary algorithms and artificial intelligence leverage the data collected from PPP assessments and outcomes to identify the strategies and specific risk factors, and protective actions that could best improve long-term outcomes for a specific patient.
- **Network and Training Program:** Training programs are available for both health coaches and health professionals in the use of PPP ([www.centerwithin.com/transformative-care-for-preventing-chronic-pain-and-addiction/](http://www.centerwithin.com/transformative-care-for-preventing-chronic-pain-and-addiction/)). The goal is to establish a virtual network of health professionals, clinics, and health coaches to provide support for patient-centered transformative care and powerful predictive analytics.

### PPP Integrates Evidence-based Self-Management Training into Routine Care

Clinical studies and systematic reviews evaluating each component of the PPP including health coaching, healthy habits, mindful pauses, calming relaxation, and on-line training has demonstrated

positive evidence-based outcomes (Table 2) [60-83]. For example, reviews of social support and health coaching show that they can improve functional recovery from chronic pain [60-73]. Clinical studies and systematic reviews of randomized clinical trials of web-based cognitive behavioral therapy, exercise, and lifestyle changes show significant improvement with chronic pain [74-79]. Clinical studies and systematic reviews of mindfulness-based stress reduction demonstrate a significant impact in reducing chronic pain [20-30], as did systematic reviews of meditation and relaxation training [31-34]. By integrating these strategies within PPP e-health training platform, it can better engage, empower, and educate patients in understanding and reversing the pain cycles that are driven by a combination of risk factors and then learning the skills of long-term self-management of them while implementing protective actions to relieve chronic pain [80-97]. Table 1 lists the sequence of learning modules in the PPP. Table 2 reviews the characteristics and scientific efficacy of each component of the PPP including identifying the risk factors that drive chronic pain cycles [80-97]

**Table 1:** Assessment and Self-Management Training Tools help patients and their providers understand pain condition and how each of the 7 realms of our lives can either contribute to pain as risk factors or help relieve and prevent chronic pain and addiction.

<b>Understanding pain</b> and how to relieve and prevent the root causes of chronic pain	Understand the big picture of pain, risk factors, protective actions, pain-relieving treatments, the cycles that cause chronic pain and the importance of self-management	
<b>Immediate Self-Care</b> starts with the most important actions to relieve pain	The importance of beginning an action plan that HEALS: <b>H</b> eat/cold/massage, <b>E</b> xercise, <b>A</b> nalgesics, <b>L</b> ifestyle, <b>S</b> train/stress reduced. HEALS is targeted to the common pain locations including jaw/face, headache, neck pain, shoulder pain, back/spine pain.	
<b>Topics</b>	<b>Training on Protective Factors</b>	<b>Assessment of risk Factors</b>
<b>Mind-set</b> starts with how our thoughts and attitudes determine how we recover	Training on how to shift to optimism, self-efficacy, realistic expectations, coping, resilience and a positive mind-set in improving pain	Risk assessment of for pessimistic attitudes, lack of self-efficacy, unrealistic expectations, poor coping and resilience and a negative mind-set in improving pain
<b>Body</b> includes our physical structures and their function	Training on how to shift to more stretching, strengthening, fitness, conditioning, balanced relaxed posture in reducing strain and pain	Risk assessment of tight weak muscles and joints, poor conditioning, tense unbalanced postures, repetitive strain that cause chronic pain
<b>Lifestyle</b> includes our daily behaviors and habits	Training on how to shift to a pain-free diet, restful sleep, steady active pacing, and limiting substance use in reducing pain	Risk assessment of Poor diet, poor sleep, sedentary or hurrying/rushed, and substance misuse that cause chronic pain
<b>Emotions</b> are our feelings both positive and negative	Training on how to shift to more joy, happiness, calm, courage, gratitude, forgiveness, empathy, self-acceptance in feeling good each day	Risk assessment for depression, sadness, anxiety, fear, anger, frustration, guilt, and shame to positive emotions that cause chronic pain
<b>Spirit</b> includes our motivation, purpose, direction and energy	Training on how to shift to have more motivation from life purpose, self-compassion, hopes and dreams, and grit and determination to achieve long-term health and reduction of pain	Risk assessment of excess stress, burnout, cynicism, doubt, feeling helplessness and hopelessness that cause chronic pain
<b>Social life</b> includes our relationships at home and work	Training on how to gain more from love and belonging, social support, work well-being, and relieving social stressors in preventing future health issues	Risk assessment of isolation, loneliness, low social support, work stress, conflict, abuse, other social stressors that cause chronic pain
<b>Environment</b> includes the safety of the world we interact with	Training on how to prevent injury with safe living, safe driving, infection-free, pollution-free, and risk-free health care	Risk assessment of unsafe living habits, risky driving, infection-prone, pollution, toxicity, and unsafe risky health care that cause chronic pain

**Table 2:** Characteristics and scientific efficacy of each component of PPPs program.

PPP Intervention	Scientific Basis	Implementation
PPP self-management	Clinical studies and systematic reviews of chronic care model self-management (41-59)	Training to reduce risk factors and strengthen protective factors
Tele-health coaching	Clinical studies and systematic reviews of health coaching and social support (60-83)	Support from health coach, friends and family, reminders, and alerts
Healthy HABITS	Clinical studies and systematic reviews of cognitive-behavioral therapy (65-75)	Healthy Actions that Bring Improvement & Transformation Daily habits of exercise, posture, diet, sleep, safety and injury prevention, and others
Daily PAUSES	Clinical studies and systematic reviews of mindfulness-based stress reduction (20-30)	Pause to Assess Understand Start new, & Enjoy moment. Mindful pauses to check in daily on body, lifestyle, thoughts, emotions, purpose, social harmony, and environment
CALMING practice	Clinical studies and systematic reviews of meditation, relaxation, and guided imagery (20-34)	Calming Actions that Lift the Mind & Mood. Calming relaxation training to relax the body, mind, and mood and gain insight, understanding, motivation, and compliance
Online delivery platform	Clinical studies and systematic reviews of computer-based and Internet interventions (46-51)	Computer and smart phone apps that are accessible, personalized, engaging interactive, confidential, and secure

### PPP Supports Patient Change with Telehealth Coaching

Telehealth Coaches are an integral part of the Pain Prevention Program (PPP) and collaborate directly with the referring provider as part of the interdisciplinary team for pain management, similar to health psychologists and physical therapists. Health Coaches are trained with academic health degrees and then are nationally board certified by the National Board of Health and Wellness Coaching ([www.nbhwc.org](http://www.nbhwc.org)). Health and wellness coaching is a relationship-centered, client-driven process designed to facilitate and empower a client to achieve self-determined goals related to health and overall well-being. While client goals may be informed by or suggested by others, such as an individual’s physician or other health provider, the selection of the goal and exploration where one is relationship to the goal is up to the client. Telehealth Coaches within PPP are well-trained to review risk assessments and provide self-management training and support to patients with pain conditions to facilitate their knowledge and skills necessary for self-management. The process incorporates the needs, goals and life experiences of the patients and is guided by evidence-based interventions for the target condition. Systematic reviews of social support and health coaching show they improve functional recovery from chronic pain (61-66). Individuals may be in any phase of readiness to make changes in their life to improve pain and illness. Health coaching provides a safe and consistent space to support positive change in health and well-being. Health Coaching

is a methodology that differs from health education or counseling or therapy, though it can work well in combination with those other practices. Health Coaching has the potential to help individuals, families, and groups achieve improved health and well-being by;

- **Setting goals.** While a person’s goals may be informed by the condition, such as the reduction of pain, or suggested by others, such as a health professional or the on-line training such as to increase physical activity, the health coach will help with customization of the goal and exploration of where one is relationship to the client-identified goal.
- **Practice grounding and calming.** The first step in coaching is to help a person be grounded in the moment to practice calming.
- **Facilitating Change.** Individuals may be just beginning to consider a change, may be exploring aspects of preparing for a change, or may be ready to implement actual actions. In a safe, consistent, non-judgmental, and supportive space, clients can explore their thoughts, emotions, and actions, in a way that allows them to recognize the power of their own choices to impact their overall wellbeing.
- **Empowering people.** Health coaches help individuals identify and nurture their resources and strengths, connecting with their intrinsic motivation and the energy needed to accomplish their desired goals.

- **Engaging responsibly.** Health coaches assume that people will function autonomously and competently, and are able to realize positive change within a safe and confidential alliance with the health coach. The coach relationship is one of inspiration, respect, and non-judgmental support.
- **Achieving goals.** By applying clearly defined knowledge and skills, the health coach can support individuals or groups in mobilizing their internal strengths and external resources to achieve sustainable changes in thoughts, beliefs, emotions, and behaviors to achieve their goal of improved health and wellbeing.

### PPP Engages and Empowers patients

The key to the success of any self-care preventive program is the ability to engage the participant in making needed changes to improve their pain. PPP works to maximize engagement with the following strategies;

- **Engaging Health Professionals:** PPP engages the healthcare provider and patient to implement transformative care that integrates training with treatment. This is done by stating to the patient; “I am happy to do my best to treat your condition, but it is more effective long-term if we also train you to reduce the lifestyle causes of your pain. Are you interested?” If consenting, the provider would enroll the patient into PPP, and then follow-up with the patient using the dashboard to track and reinforce progress.
- **Support by Tele-Health Coach (THC):** THCs are well-educated and board-certified health professionals who can support success of a participant’s self-management training. The health coach helps the participant understand their goals, risk factors, protective factors, barriers, and individual skills and talents to help them through the program.
- **Structured pain management program:** The program provides pain assessment, multi-dimensional risk assessments, personalized risk reduction training, and patient-directed health coaching in each of the seven realms of a patient’s life: Mind, Body, Lifestyle, Emotions, Spirit, Social Life, and Environment (Table 3).
- **Shift to patient-centered paradigms:** PPP will help the patient, health professional, and the health care system shift to more patient-centered clinical paradigms that facilitate patient empowerment and improved long-term outcomes.
- **Accessible by any device:** PPP is delivered through a responsive website and mobile app that can be accessed via smart phone, tablet, or computer (www.preventionprogram.com)
- **Supported by Family and Friends:** Having friend or family team member who can support participants and encourage them along their journey is important. Each participant can sign up any teammate at the beginning or at any time, using the team link of the dashboard.
- **Understanding the whole person:** In contrast to the limited scope or fragmentation of many pain training and treatment programs, PPP is intended to help people evaluate all aspects of their life including the body, mind, lifestyle, emotions, spirit, social life, and environment. To engage the patient in learning, there are various interactive playful, gaming components, including bursting the benefit bubbles, breaking barrier bricks, interesting stories of people, and acronyms of phrases to help patients remember the concepts.
- **Simple Action Plan:** An action plan that is generated for each module includes 3 components: Healthy HABITS, daily mindful PAUSES, and CALMING relaxation practice. Overcoming barriers is discussed to help individuals complete the action plans.
- **Dashboard:** A dashboard based on the pain assessments is provided to track participant engagement in the program, pain, interference, action plan status, and risk factor assessment.
- **Reminders:** The program sends out reminders to the participant to reinforce success and encourage completion of the program.
- **Handouts:** The program also has many resources that provide written documentation for each lesson including an action plan summary, a daily log, and worksheets for each lesson.

**Table 3: A Guide for Patient Services in Pain Prevention Program.**

<p>The Program is a 6-month therapeutic program that guides patients in patient-centered strategies to relieve pain conditions and prevent chronic pain, delayed recovery, substance misuse and the opioid crisis. The program includes assessments, learning modules, telehealth coach support, progress dashboard, and resource handouts to help patients heal and recover from pain conditions. Patient services include the following services over 6 months.</p>	
<p><b>Clinic Actions:</b> Provider completes evaluation, diagnosis, and transformative treatment plan including PPP self-care training and coaching support. If consents, the provider refers the patient to PPPs team using an order set. The staff enrolls the patient in PPP &amp; schedule 1<sup>st</sup> telehealth coach visit. Patient receives email from Coach and accesses PPP platform. Patient consents to terms, begins PPP assessments, training modules, and telehealth coaching sessions. The billing to health plans uses the code CPT 99409 (SBIRT) to provide Screening, Brief Intervention and Referral for Treatment to prevent chronic pain and associated substance misuse. The fees are billed by the referring healthcare provider since the care is an extension of the provider's care and is under direct supervision and collaboration in managing the pain problem.</p>	
<p><b>PPP Assessments and Training Modules</b> Assessments are completed and reviewed by coach and provider to understand and personalize training and support. Progress on learning modules are self-directed by the patient.</p>	<p><b>PPP Telehealth Coaching Sessions</b> Health Coach supports patients in achieving their goals of recovery from pain and achieving health and well-being. Each session is directed by the patient and their goals</p>
<p><b>Introduction to PPP Module:</b> Overview of learning modules in PPP Program and telehealth coaching. Patient <b>completes assessments</b> including current pain, severity, previous care, goals, coping strategies, risk factors, and protective factors.</p>	<p><b>Orientation:</b> Discuss PPPs program with learning and health coaching. Discuss background, rationale, timetable, 7 realms, and goals of program. Assess readiness for change and interest in engaging in a self-management program.</p>
<p><b>Understand Pain:</b> Learn about causes of chronic pain and how treatment with self-care can heal pain long-term. Pain Assessment reviewed to understand risk and protective factors to relieve pain.</p>	<p><b>Big Picture Goals:</b> Review Pain and Risk Assessment with patient. Explore overall vision and goals for preventing chronic pain and addiction while encouraging a healthy life within the 7 realms.</p>
<p><b>Immediate Self Care:</b> Learn how and why self-care HEALS actions can begin to heal and relieve pain Self-Care Assessment reviewed with current self-care strategies used to better cope with pain.</p>	<p><b>Pain Cycles:</b> Review Assessments with patient. Coach reviews how pain, risk factors and pain cycles drive pain, and protective self-care actions and treatments to heal pain.</p>
<p><b>Mind Modules:</b> Learn how positive mindset, thoughts and attitudes can improve pain. Mind Assessment reviewed to identify thoughts and attitudes that impact pain.</p>	<p><b>Mind Realm:</b> Review Mind Assessment with patient. Provide coaching support for goals and how optimism, having self-efficacy, realistic expectations, and resilience help recovery from pain.</p>
<p><b>Body Module:</b> Learn how use of body with exercise, posture, and reduced strain to improve pain. Body Assessment reviewed for how body use impacts pain and recovery.</p>	<p><b>Body Realm.</b> Review Body Assessment with patient. Provide coaching support for goals and for implementing optimal posture, stretching, exercise, and reduce straining to impact pain.</p>
<p><b>Lifestyle Modules:</b> Learn how to improve daily behaviors of diet, sleep, substance use, and pacing to improve pain. Lifestyle Assessment reviewed including diet, sleep, substance use, &amp; pacing impact pain &amp; recovery.</p>	<p><b>Lifestyle Realm:</b> Review Lifestyle Assessment with patient. Provide coaching support for goals and implementing an anti-inflammatory diet, restful sleep, balanced pacing, and limiting substance use can impact pain.</p>
<p><b>Emotions Modules:</b> Learn how emotional coping and processing impacts pain and recovery. Emotion Assessment reviewed including positive and negative emotions that impact pain &amp; recovery,</p>	<p><b>Emotions Realm.</b> Review Emotions Assessment with patient. Provide coaching support for goals and understand emotions, coping with negative emotions and shift to positive emotions to impact pain.</p>
<p><b>Spirit Modules:</b> Learn how motivation, purpose, meaning can impact pain and recovery. Spirit Assessment reviewed including motivation, hopes, determination impact pain and recovery.</p>	<p><b>Spirit Realm.</b> Review Spirit Assessment with patient. Provide coaching support for goals and understanding the role of purpose, self-compassion, hopes and dreams, and determination in recovery from pain.</p>

<b>Social Life Modules:</b> Learn how social connections and support can impact pain and recovery. Social Assessment reviewed and how relationships impact pain & recovery.	<b>Social Realm.</b> Review Social Assessment with patient. Provide coaching support for goals and to understand how social belonging, positive support, and relationships impact pain.
<b>Environment Modules:</b> Learn how living safely within the world around impacts pain & recovery. Environmental Assessment reviewed with safety factors impacting pain and recovery.	<b>Environmental Realm.</b> Review Environment Assessment with patient. Provide support for goals and safety in the environment that you live, work, and receive care in and how to prevent re-injury.
<b>Living in the 7 Realms:</b> Integrating a whole health plan to prevent pain. Final Assessment reviewed.	<b>Final Session.</b> Review Final Assessment with patient. Provide support with takeaways, progress, resources and goals beyond PPPs program.

### Research and Development Methods

With funding from National Institutes of Health (R34DE024260 and U01DE025609), the PPP was developed to integrate robust self-management training with treatment to improve long-term outcomes of people with pain conditions. Table 4 describes the development of the PPP using standard processes for Innovation and change within healthcare. The process was implemented in collaboration with faculty, researchers, clinicians, and developers at the University of Minnesota, HealthPartners Institute, and a supportive input from health plans and pain clinics.

**Table 4:** Addressing the chronic pain and opioid crisis by employing the process of Innovation and change in healthcare.

<b>Understanding the Problem: Chronic Pain and the Opioid Crisis</b>	
1. Problem defined	Opioid dependency due to pain and resultant overdose deaths High cost and impact of chronic pain Poor long-term outcomes of treatment for pain conditions Lack of patient engagement in solutions
2. Potential solutions explored	Deny opioids for patients in pain Medication replacement strategies with less addicting opioids Interventions, injections, and passive pain treatments Transformative care: patient self-care training with treatment
3. Propose best practice solution	Transformative care by integrating preventive training and treatment is triple win for: 1) Patients (empowered solve problem long-term), 2) Providers (engage patient and improve outcomes), and 3) Payers (reduce costs and support patient-centered care)
4. Plan and develop solution	Leverage the knowledge and experience of national initiatives to address chronic pain and addiction. The University of Minnesota supported the pre-development grant that involves content development and testing with on-line course ( <a href="http://www.coursera.org/learn/chronic-pain">www.coursera.org/learn/chronic-pain</a> )
<b>Develop Best Practice Solution: Transformative Care with Pain Prevention Program</b>	
5. Prepare and pre-development plan	The Pain Prevention Program (PPP) was developed with team at University of Minnesota and HealthPartners Institute. PPP includes; 1) Chronic pain and addiction risk assessment 2) Pain risk reduction and self-care training program 3) Telehealth Coaching support for self-management 4) Remote monitoring with patient-centered dashboard
6. Implement in clinical practice	Implement PPP Patient Engagement Platform within Minnesota Head and Neck Pain Clinic ( <a href="http://www.mhnpc.com">www.mhnpc.com</a> ). Modification of PPP occurred in response to feedback.
7. Outcomes with clinical trial	National Institutes of Health Planning grant (R34DE024260) with HealthPartners Institute and Medical and Dental Group

8. Improve acceptability and adoption	PPP content modification and testing to improve acceptability by HealthPartners Institute development team
<b>Plans for Adoption, Implementation, and Dissemination of PPP</b>	
9. Payment and reimbursement strategy developed	Collaboration with health plans to further develop reimbursement strategy including CPT codes with documentation
10. Reduction of health care costs	Collaborate with healthcare organizations, health plans and providers to demonstrate reduction of healthcare costs of the PPP
11. Production with early adopters	Evaluate initial implementation with several clinics and evaluation of engagement, barriers to implementation, and reimbursement
12. Promote national implementation and Dissemination	Develop strategy for national implementation with healthcare organizations. This would include introduction, rationale member training programs, and presentations

### Pre-Development

A complimentary on-line course on Preventing Chronic Pain and Addiction was developed through the University of Minnesota at [www.coursera.org/learn/chronic-pain](http://www.coursera.org/learn/chronic-pain) to review the evidence-based knowledge on preventing chronic pain. The course uses both creative and experiential learning to better understand chronic pain conditions and how they can be prevented through self-management within cognitive, behavioral, physical, emotional, spiritual, social, and environmental realms. Preliminary data from the initial complementary offering of the online training program for preventing chronic pain is presented in Table 5. In a study of training people to prevent chronic pain [46], 771 participants with pain enrolled, with 93% completing the on-line training program. The 6 most common pain areas included neck and back pain (26%), head, jaw, and face (21.5%), leg, knee, and feet (21.5%), arm, elbow, and hand (10.5%), shoulder, chest, and abdomen (9.9%), and pelvic and hip (6.6%). The severity of pain (0-10)

scale was 8.2 and interference (0-10) was 7.1. In the past year, they had seen on average 9.2 healthcare visits for their pain, with many also having surgery or emergency visits. In response to the question on change, 93% of these participants with pain noted that it changed their life to improve their pain. In addition, 85% of the health professionals who enrolled (n= 290) stated that changed their care plan to include self-care strategies. Comments from the training included:

“Absolutely fascinating and enlightening...should be part of every health care educational program!”

“This course has really helped me to understand myself better and why I think, act and see the world as I do.”

“I am eternally grateful for taking the time and energy to provide this beacon of knowledge to the world.”

“I think this course is a wonderful gift, because pain is an avoidable part of our life. I have learned so many things.”

**Table 5:** Preliminary outcomes for PPPs-based online self-management training without health coach. (n=771 with 93% completing entire online training) {46}.

Training quality (% rated very good to excellent)	Lessons	95%
	Self-assessments	75%
	Action plan	82%
	Handouts	68%
Training outcomes (% of the initial goals met)	Learning was satisfying	91%
	Objectives were met	92%
	Relevant to their daily life	91%
	Made a different in their life	93%
	Changed care plan for pain	85%

### PPP Clinical study

A randomized clinical study was completed at a large health group (NIH U01DE025609) with a sample of 81 patients who were randomly assigned to PPP or usual care (Table 6) [52-54]. Usual care consisted of self-care handouts with standard treatment of pain conditions including non-surgical rehabilitation, physical therapy, and medication. The pain outcomes found that worst pain severity, average pain severity, pain interference, limitation in daily activity, and sleep all improved over 16 weeks within PPP group compared to usual care. In addition, protective factors including physical activity, patient activation and self-efficacy all improved over 16 weeks with PPP compared to usual care.

**Table 6:** Results of using PPP for chronic pain population in Randomized Clinical Trial compared to usual care—A Transformative Self-Management Program for Chronic Pain Utilizing On-line Training and Telehealth Coaching (50-52).

Outcomes Reported as Cohen' D (Mean change/sd)			PPP (n=40) Mean change from pre to post	Usual care (n=41) Mean change from pre to post	Difference between PPP vs Usual Care
Outcome	Metric (Scale + or -)	Scale			
Pain	Worst Pain Severity (-)	0 - 10	-1.19	-0.79	-0.4
Pain	Average Pain severity (-)	0 - 10	-0.47	-0.31	-0.16
Function	Limited usual activity (-)	0-30 days	-24.0	-17.0	-8.0
Function	Sleep problems (-)	0 - 10	-6.9	-3.8	-3.1
Function	Exercise level (+)	min/day	0.07	-0.03	0.09
Protective	Patient Activation (+)	0-1	0.6	0.23	0.37
Protective	Self-Efficacy (+)	0-1	0.44	0.29	0.15

### Clinical Implementation

PPP has been developed and tested to be an easily implemented and reimbursed in both primary and specialty care. It can be set-up to enhance care without significant disruption or changes to current daily schedules. Providers can engage health and wellness coaches who are nationally board-certified ([www.nbhwc.com](http://www.nbhwc.com)) and trained in the PPP as pain prevention specialists. If a health professional is interested in using the PPP, the team will register each provider and staff from their health group. Each healthcare provider can then refer and enroll patients in PPP, provide training and health coaching support and track progress. The PPP can help support health professionals office team in billing to health plans using a variety of CPT codes depending on the health plan. Automated encounter plans for the PPP can be set up in the clinic's electronic health record to provides clear documentation, order sets and billing, brief explanations for the patients on their role in managing their illness long-term, and scheduling an initial visit with the pain prevention specialist.

The training of health professionals in the implementation and use of the PPP is available at an on-line course at <https://www.centerwithin.com/transformative-care-for-preventing-chronic-pain-and-addiction/>. This course covers the following objectives:

- Understanding the transformative care model in order to implement treatment plus patient self-care training using technology and coaching
- Understanding the goals of PPP in implementing transformative care and telehealth coaching for patient self-management of pain training
- Understanding the pain and risk assessments and how they personalize training.
- Understanding the patient-centered paradigm shifts required in transformative care
- Connecting teams you with a nationally-certified telehealth coach.
- Explaining the critical role of the patient in treatment planning with PPP
- Enrolling participants, reviewing consents, establishing reimbursement processes, and scheduling the first introductory coaching visit with patients
- Billing of PPP services using CPT codes including risk assessment and training and telehealth coaching to Health Insurance
- Tracking participant engagement and progress within the dashboard

### **Benefits and Challenges in use of the PPP**

Clinical use of the PPP has demonstrated significant benefits to patient care as well as barriers to implementation. In preliminary clinical adoption of PPP, the results have shown to successfully address the Institute for Health Care Improvement's triple aim to improve the patient's experience of care, enhance the health of the patient, and controlling the cost of health care [40]. In a case series of 25 patients, we found that the patients who were engaged in the program reduced their pain level, healthcare use, medication use, and cost of healthcare. However, some patients with pain conditions choose to only participate in passive treatment such as physical therapy, prescription medications, and injections and did not believe additional self-care is needed. Furthermore, some healthcare providers believe that it is not their responsibility to provide self-care training and only rely on their treatments for pain conditions, often medications. It has also been a challenge to change the care paradigms of health professionals and health care administrators to

embrace transformative care by integrating training with treatment using the PPP. Although most health professionals agree with the need to offer self-care training, changing the dialogue with patients to explain the need for prevention with self-management training has been a barrier. Several other barriers were identified in implementation including the additional time spent explaining the program, differing or limited reimbursement strategies by health plans, and administrative challenges within health system leadership to adopt transformative care model. As more and more health professionals and patients see the benefits of programs such as the PPP, broad scale adoption will occur, particularly as it continues to be reimbursed by health plans.

### **Summary and Future Directions**

Chronic pain is the big elephant in the room of health care. It is the top reason to seek care, the #1 cause of disability and addiction, and the primary driver of healthcare utilization, costing more than cancer, heart disease, and diabetes combined [1-10]. More than half of the persons seeking care for pain conditions at one month still have pain five years later despite treatment, due to lack of training for patients to reduce the many lifestyle risk factors that lead to delayed recovery and chronic pain. The lack of reimbursement, adequate time, and skills as reasons why the critical task of self-management training rarely occurs in the health care system. Yet, there is ample evidence to demonstrate that patient-centered approaches to address risk factors such as cognitive behavioral therapy (CBT), therapeutic exercise, and mindfulness-based stress reduction can activate and empower patients in reducing risk factors for chronic pain and implementing protective actions to improve pain long-term [60-97].

The Pain Prevention Program (PPP) at [www.preventionprogram.com](http://www.preventionprogram.com) was developed and tested to support the healthcare system in preventing chronic pain and addiction and help address the chronic pain and opioid crisis. The PPP has demonstrated initial success in engaging healthcare professionals and patients to shift to transformative care where patient engagement is paramount and self-management training is smoothly integrated with treatment to improve long-term outcomes of pain conditions. [49-52] Future research will study broad scale implementation by engaging the national network of health and wellness coaches in collaborating with health professionals in routine care. Thus, there is a current call for action from health groups to begin the broad scale implementation of the PPP nationally and conduct further research. Future research will evaluate broad scale outcomes, cost reduction in healthcare, and identifying and overcoming barriers to implementation, reimbursement, patient engagement, and successful outcomes.

## References

1. Institute of Medicine. *Relieving Pain in America (2011) A Blueprint for Transforming Prevention, Care, Education, and Research*. National Academies Press, Washington, DC.
2. Interagency Pain Research Coordinating Committee. *National pain strategy: a comprehensive population health-level strategy for pain*. Washington, DC: US Department of Health and Human Services, National Institutes of Health.
- 1.
3. Hooten WM, Timming R, Belgrade M, Gaul J, Goertz M, Haake B, Myers C, Noonan MP, Owens J, Saeger L, Schweim K, Shteyman G, Walker N. Institute for Clinical Systems Improvement. *Assessment and Management of Chronic Pain: Healthcare Guideline*.
4. Clarke TC, Nahin RL, Barnes PM, Stussman BJ (2016) Use of complementary health approaches for musculoskeletal pain disorders among adults: United States, 2012. *National health statistics reports; no 98*. Hyattsville, MD: National Center for Health Statistics.
5. Dowell D, Haegerich TM, Chou R (2016) CDC Guideline for Prescribing Opioids for Chronic Pain--United States, 2016. *JAMA* 315: 1624–1645.
6. U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES Strategy to Combat Opioid Abuse, Misuse, and Overdose. A Framework Based on the Five Point Strategy.
7. Dahlhamer J, Lucas J, Zelaya, C, et al. (2018) Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults — United States, 2016. *MMWR Morb Mortal Wkly Rep* 67:1001–1006.
8. Appendix C (2011) *The Economic Costs of Pain in the United States* by Darrell J. Gaskin, Ph.D. and Patrick Richard, Ph.D., M.A. in the Institute of Medicine. *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*. Washington DC: National Academies Press.
9. Park PW, Dryer RD, Hegeman-Dingle R, Mardekian J, Zlateva G, Wolff GG MPH, Lamerato LE (2016) Cost Burden of Chronic Pain Patients in a Large Integrated Delivery System in the United States. *Pain Practice*, 16 1001–1011.
10. Hestbaek L, Leboeuf-Yde C, Manniche C (2003) Low-back pain: what is the long-term course? A review of studies of general patient populations. *Eur Spine J* 12:149-65.
11. Deyo, RA; Mirza, SK; Turner, JA; Martin, BI (2009). Over-treating chronic back pain: time to back off? *Journal of the American Board of Family Medicine: JABFM* 22 (1): 62–8.
12. Wilco, et al (2011) Surgery versus conservative management of sciatica due to a lumbar herniated disc: a systematic review. *Eur Spine J* 20: 513–522
13. Yunus MB (2008) Central sensitivity syndromes: a new paradigm and group nosology for fibromyalgia and overlapping conditions, and the related issue of disease versus illness. *Semin Arthritis Rheum* 37(6): 339-52.
14. McGreevy K Bottros MM, Raja SN (2011) Preventing Chronic Pain following Acute Pain: Risk Factors, Preventive Strategies, and their Efficacy. *Eur J Pain Suppl* 11:365-372.
15. Aggarwal VR, Macfarlane GJ, Farragher TM, McBeth J (2010) Risk factors for onset of chronic orofacial pain-results of the North Cheshire orofacial pain prospective population study. *Pain* 149: 354-9.
16. Scher AI, Stewart WF, Ricci JA, Lipton RB (2003) Factors associated with the onset and remission of chronic daily headache in a population-based study. *Pain* 106: 81-89.
17. Cote P, Cassidy JD, Carroll LJ, Kristman V (2004) The annual incidence and course of neck pain in the general population: a population-based cohort study. *Pain*. 112 267–273.
18. Lim PF, Smith S, Bhalang K, Slade GD, Maixner W (2010) Development of temporomandibular disorders is associated with greater bodily pain experience. *Clin J Pain* 26(2): 116-20.
- 2.
19. Morley S, Eccleston C, Williams A (1999) Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. *Pain* 80:1–13
20. Harris P, Loveman E, Clegg A, Easton S, Berry N (2015) Systematic review of cognitive behavioural therapy for the management of headaches and migraines in adults. *Br J Pain*. 9(4): 213–224.
21. Gordon R, Bloxham S (2016) A Systematic Review of the Effects of Exercise and Physical Activity on Non-Specific Chronic Low Back Pain. *Healthcare (Basel)*. 4(2):22
22. Tang NK, Lereya ST, Boulton H, Miller MA, Wolke D, Cappuccio FP (2015) Nonpharmacological Treatments of Insomnia for Long-Term Painful Conditions: A Systematic Review and Meta-analysis of Patient-Reported Outcomes in Randomized Controlled Trials. *Sleep* 38(11):1751-64
23. Marley J, Tully MA, Porter-Armstrong A, Bunting B, O'Hanlon J, McDonough SM (2014) A systematic review of interventions aimed at increasing physical activity in adults with chronic musculoskeletal pain—protocol. *Systematic Reviews* 3:106
24. Cramer H, Lauche R, Haller H, Dobos G (2013) A systematic review and meta-analysis of yoga for low back pain. *Clinical J of Pain* 29:450-460.
25. Hayden JA, van Tulder MW, Tomlinson G (2005) Systematic Review: Strategies for Using Exercise Therapy To Improve Outcomes in Chronic Low Back Pain. *Ann Intern Med* 142:776-785
26. Chiesa A, Serretti A (2011) Mindfulness-based interventions for chronic pain: a systematic review of the evidence. *J Altern Complement Med* 17(1):83-93
27. Hilton L, Hempel S, Ewing BA, Apaydin E, Xenakis L, Newberry S, Colaiaico B, Maher AR, Shanman RM, Sorbero ME, Maglione MA (2016) Mindfulness Meditation for Chronic Pain: Systematic Review and Meta-analysis. *Ann Behav Med*.
28. Rosenzweig S1, Greeson JM, Reibel DK, Green JS, Jasser SA, Beasley D (2010) Mindfulness-based stress reduction for chronic pain conditions: variation in treatment outcomes and role of home meditation practice. *J Psychosom Res* 68(1):29-36.
29. Garmon B, Philbrick J, Becker D, Schorling J, Padrick M, Goodman M, Owens JE (2014) Mindfulness-based stress reduction for chronic pain: a systematic review. *J of Pain Management* 7:23-36.
30. Galante J, Galante I, Bekkers MJ, Gallacher J (2014) Effect of kindness-based meditation on health and well-being: a systematic review and meta-analysis. *J Consult Clin Psychol*. 82(6):1101-14
31. Kwekkeboom KL, Gretarsdottir E (2006) Systematic review of relaxation interventions for pain. *J Nurs Scholarsh* 38(3):269-77.
32. Leppin AL, Gionfriddo MR, Sood A, Montori VM, Erwin PJ, Zeballos-Palacios C, Bora PR, Dulohery MM, Brito JP, Boehmer KR, Tilbur JC (2014) The efficacy of resilience training programs: A systematic review protocol. *Systematic Reviews* 3(1):20
33. Bailey KM, Carleton RN, Vlaeyen JWS, Asmundson GJG (2010)

- Treatments Addressing Pain-Related Fear and Anxiety in Patients with Chronic Musculoskeletal Pain: A Preliminary Review. *Cognitive Behaviour Therapy* 39(1):46-63
34. Veehof MM, Oskam MJ, Schreurs KMG, Bohlmeijer ET (2011) Acceptance-based interventions for the treatment of chronic pain: A systematic review and meta-analysis. *PAIN*152(3):533–542.
  35. Campbell P, Wynne-Jones G, Dunn KM (2010) The influence of informal social support on risk and prognosis in spinal pain: A systematic review. *European journal of pain* 15(5):444, e1-14
  36. Kamper SJ, Apeldoorn AT, Chiarotto A, Smeets R J E M, Ostelo R W J G, Guzman J, van Tulder MW (2015) Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. *BMJ* 350.
  37. Holden J, Davidson M, O'Halloran PD (2014) Health coaching for low back pain: a systematic review of the literature. *Int J Clin Pract* 68(8):950-62
  38. Garg S, Garg D, Turin TC, Chowdhury MFU (2016) Web-Based Interventions for Chronic Back Pain: A Systematic Review. *J Med Internet Res*: 18
  39. Buhrman M, Gordh T, Andersson G (2016) Internet interventions for chronic pain including headache: A systematic review. *Internet Interventions* 4(1):17–34
  40. Institute for Healthcare Improvement's (IHI) Triple Aim at <https://www.ihl.org/improvement-areas/improvement-area-triple-aim-and-population-health>
  41. Miles CL, Pincus T, Carnes D, et al. (2011) Can we identify how programmes aimed at promoting self-management in musculoskeletal pain work and who benefits? A systematic review of sub-group analysis within RCTs. *Eur J Pain* 15(8):775.e771-711.
  42. Clark, TS (2000) Interdisciplinary treatment for chronic pain: is it worth the money? *Proc (Bayl Univ Med Cent)*. 13(3): 240–243.
  43. Sletten CD, Kurklinsky S, Chinburapa V, Ghazi S. Economic Analysis of a Comprehensive Pain Rehabilitation Program: A Collaboration Between Florida Blue and Mayo Clinic Florida.
  44. Berry LL, Mirabito AM, Baun WB. What's the Hard Return on Employee Wellness Programs? *Harvard Business Review*.
  45. Goetzel RZ and Ozminkowski RJ (2008) The Health and Cost Benefits of Work Site Health-Promotion Programs. *Annual Review of Public Health*. 29: 303-323.
  46. Friction, JR, Anderson K, Clavel A, et al. (2015) Preventing Chronic Pain: A Human Systems Approach—Results From a Massive Open Online Course. *Global Adv Health Med* 4(5):23-32
  47. Friction, JR (2015) The Need for Preventing Chronic Pain. *Global Advances in Health and Medicine* 4(1), 6-7.
  48. Friction, JR, Gupta A, Weisberg MB, Clavel A (2015) Can We Prevent Chronic Pain? *Practical Pain Management* 1-9
  49. Friction, J, Clavel A, Weisberg M (2016) Transformative Care for Chronic Pain. *Pain Week Journal*: pp44-57.
  50. Friction J, Whitebird R, Vazquez-Benitez G, Grossman E, Ziegenfuss J, Lawson K (2018) Transformative Self-Management for Chronic Pain Utilizing Online Training and Telehealth Coaching. *Health Care Systems Research Conference*; Minneapolis.
  51. Grossman E, Vazquez-Benitez G, Whitebird R, Lawson K, Friction J (2018) The Pain Prevention Program-A Self-Management Program for Chronic Pain utilizing Online Education and Telehealth Coaching, Findings of the Pilot Study. *Health Care Systems Research Conference*; Minneapolis.
  52. Sour E, Ziegenfuss J, Grossman E, Vazquez-Benitez G, Whitebird R, Friction J (2018) Highly Motivated Population Provides Two Successful Recruitment Methods into Self-Care Study and Pain Prevention Program. *Health Care Systems Research Conference*; Minneapolis.
  53. Glasgow RE, Funnell MM, Bonomi AE, Davis C, Beckham V, Wagner EH (2002) Self-Management aspects of the improving chronic illness care breakthrough series: Implementation with diabetes and heart failure teams. *Annals of Behavioral Medicine* 24(2):80-87.
  54. Battersby M; Von Korff M; Schaefer J; Davis C, Ludman E, Greene SM, Parkerton M, Wagner EH (2010) Twelve Evidence-Based Principles for Implementing Self-Management Support in Primary Care. *The Joint Commission Journal on Quality and Patient Safety*. 36(12):561-570(10)
  55. Russell E, Glasgow et al. (2003) Implementing Practical Interventions to Support Chronic Illness Self-Management. *Joint Commission Journal on Quality and Patient Safety via Jt Comm*. *J Qual Patient Saf*. 29(11):563-574.
  56. Tsai AC, Morton SC, Mangione CM, Keeler EB (2005) A Meta-Analysis of Interventions to Improve Care for Chronic Illnesses. *Am J Manag Care*. 11(8): 478–488
  57. Glasgow RE, Funnell MM, Bonomi AE, Davis C, Beckham V, Wagner EH (2002) Self-Management aspects of the improving chronic illness care breakthrough series: Implementation with diabetes and heart failure teams. *Annals of Behavioral Medicine* 24(2):80-87.
  58. Gee PM, Greenwood DA, Paterniti DA, Ward D, Miller LMS (2015) The eHealth Enhanced Chronic Care Model: A Theory Derivation Approach. *J Med Internet Res* 17(4):e86
  59. Gammon D, Berntsen GKR, Koricho AT, Sygna K, Ruland C (2015) The Chronic Care Model and Technological Research and Innovation: A Scoping Review at the Crossroads. *J Med Internet Res* 17(2):e25
  60. Hamine S, Gerth-Guyette E, Faulx D, Green BB, Ginsburg AS (2015) Impact of mHealth Chronic Disease Management on Treatment Adherence and Patient Outcomes: A Systematic Review. *J Med Internet Res* 17(2):e52
  61. Bennett HD, Coleman EA, Parry C, Bodenheimer T, Chen EH (2010) Health Coaching for Patients With Chronic Illness. Does your practice "give patients a fish" or "teach patients to fish"? *Fam. Pract. Manag*. 17(5):24-29
  62. Foster G, Taylor SJC, Eldridge SE, Ramsay J, Griffiths CJ (2007) Self-management education programmes by lay leaders for people with chronic conditions. *Cochrane Database Syst Rev*17(4):CD005108.
  63. Gensichen J, von Korff M, Peitz M, et al. (2009) Case management for depression by health care assistants in small primary care practices. *Ann Intern Med* 151:369–378.
  64. Vale MJ, Jelinek MV, Best JD, et al. (2003) Coaching patients on achieving cardiovascular health (COACH): A multicenter randomized trial in patients with coronary heart disease. *Arch Intern Med* 163:2775–2783.
  65. Gary TL, Bone LR, Hill MN, et al. (2003) Randomized controlled trial of the effects of nurse case manager and community health worker interventions on risk factors for diabetes-related complications in urban African Americans. *Prev Med* 37:23–32.
  66. J. Holden J, Davidson M, O'Halloran PD et al (2014) Health coaching for low back pain: a systematic review of the literature. *Int J Clin Pract* 68:950-62.
  67. Macea, Gajos K, Calil YAD, Fregni F (2010) The efficacy of Web-

- based cognitive behavioral interventions for chronic pain: a systematic review and meta-analysis. *J Pain* 11:917–29
68. Bender JL, Radhakrishnan A, Diorio C, Englesakis M (2011) Can pain be managed through the Internet? A systematic review of randomized controlled trials. *Pain* 152:1740–50.
  69. Gratzner D, Khalid-Khan F (2015) Internet-delivered cognitive behavioural therapy in the treatment of psychiatric illness. *CMAJ* pii:150007.
  70. Eaton LH, Doorenbos AZ, Schmitz KL, Carpenter KM, McGregor BA (2011) Establishing treatment fidelity in a web-based behavioral intervention study. *Nurs Res* 60(6):430-5.
  71. Wantland DJ, Portillo CJ, Holzemer WL, Slaughter R, McGhee EM (2004) The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. *J Med Internet Res* 6(4):e40.
  72. Paul CL, Carey ML, Sanson-Fisher RW, Houlcroft LE, Turon HE (2013) The impact of web-based approaches on psychosocial health in chronic physical and mental health conditions. *Health Educ Res* 28(3):450-71
  73. Lau PW, Lau EY, Wong del P, Ransdell L (2011) A systematic review of information and communication technology-based interventions for promoting physical activity behavior change in children and adolescents. *J Med Internet Res*. 13;13(3).
  74. Debora Duarte Maceia, Krzysztof Gajos, Yasser Armynd Daglia Calil, Felipe Fregni (2010) The Efficacy of Web-Based Cognitive Behavioral Interventions for Chronic Pain: A Systematic Review and Meta-Analysis. *The Journal of Pain* 11(10): 917-929.
  75. van den Berg MH, Schoones JW, Vliet Vlieland TP (2007) Internet-based physical activity interventions: a systematic review of the literature. *J Med Internet Res* 9(3):e26.
  76. Bartholomew, LK, Mullen, PD (2011) Five roles for using theory and evidence in the design and testing of behavior change interventions. *Journal of Public Health Dentistry. Special Issue: Behavioral and Social Intervention Research Essentials* 71( s1): 1752-7325
  77. Fry JP, Neff RA (2009) Periodic prompts and reminders in health promotion and health behavior interventions: systematic review. *J Med Internet Res*. 14;11(2):e16.
  78. Friction, J, Velly, A. Ouyang W., Look, J (2009) Does exercise therapy improve headache? A systematic review with meta-analysis. *Current Pain & Headache Reports*. 13(6):413-419.
  79. Cherkin DC, Sherman KJ, Balderson BH; et al (2016) Effect of Mindfulness-Based Stress Reduction vs Cognitive Behavioral Therapy or Usual Care on Back Pain and Functional Limitations in Adults With Chronic Low Back Pain A Randomized Clinical Trial. *JAMA* 315(12):1240-1249
  80. Elliot NG, Donna PF (1984) Factors associated with successful outcome from behavioral therapy for chronic temporomandibular joint (TMJ) pain. *Journal of Psychosomatic Research* 28(6):441-8.
  81. Maixner W, Greenspan JD, Dubner R, Bair E, Mulkey F, Miller V, Knott C, Slade GD, Ohrbach R, Diatchenko L, et al. (2011) Potential autonomic risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study. *J Pain*. 12(11 Suppl):T75-91.
  82. Mansour M (2002) Systems theory and human science. *Annual Reviews in Control* 26(1):1-13
  83. Bailey K (2006) Living systems theory and social entropy theory. *Systems Research and Behavioral Science*. 22, 291-300.
  84. Miller JG (1978) *Living systems*. New York: McGraw-Hill. ISBN 0-87081-363-3.
  85. Seppänen J (1998) Systems ideology in human and social sciences. In G. Altmann & W.A. Koch (Eds.), *Systems: New paradigms for the human sciences*. Berlin: Walter de Gruyter 180–302.
  86. Rolland JS (1987) *Chronic Illness and the Life Cycle: A Conceptual Framework*. *Fam Proc*. 26:203-221.
  87. Dym D (1987) *The Cybernetics of Physical Illness*. *Family Process* 26(1) 35–48.
  88. Turner JA, Holtzman S, Mancl L (2007) Mediators, moderators, and predictors of therapeutic change in cognitive-behavioral therapy for chronic pain. *Pain* 127(3):276-86.
  89. Jensen MP, Turner JA, Romano JM (1994) Correlates of improvement in multidisciplinary treatment of chronic pain. *J Consult Clin Psychol* 62(1): 172-9.
  90. Jensen MP, Turner JA, Romano JM (1991) Self-efficacy and outcome expectancies: relationship to chronic pain coping strategies and adjustment. *Pain* 44(3): 263-9.
  91. Turner JA, Whitney C, Dworkin SF, Massoth D, Wilson L (1995) Do changes in patient beliefs and coping strategies predict temporomandibular disorder treatment outcomes? *Clin J Pain* 11(3): 177-88.
  92. Jensen MP, Nielson WR, Turner JA, Romano JM, Hill ML (2004) Changes in readiness to self-manage pain are associated with improvement in multidisciplinary pain treatment and pain coping. *Pain* 111(1-2): 84-95.
  93. Friction JR, Nelson A, Monsein M (1987) IMPATH: microcomputer assessment of behavioral and psychosocial factors in craniomandibular disorders. *Cranio* 5(4): 372-81.
  94. Bigos SJ, Battie MC (1992) Risk factors for industrial back problems. *Sem Spine Surg* 4:2-11
  95. Pincus T, Burton AK, Vogel S, Field AP (2002) A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. *Spine* 27:E109-20.
  96. Turk DC, Okifuji A (2002) Psychological factors in chronic pain: evolution and revolution. *J Consult Clin Psychol* 70(3):678-90.
  97. Turner JA, Holtzman S, Mancl L (2007) Mediators, moderators, and predictors of therapeutic change in cognitive-behavioral therapy for chronic pain. *Pain* 127(3):276-86.