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Review Article

Preventing Chronic Pain: Solutions to a Public Health Crisis

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Abstract

Chronic pain is the top reason to seek care, the top cause of disability and addiction, and the primary driver of healthcare utilization. More than half of the persons seeking care for pain conditions at 1 month still have pain 5 years later despite treatment due to lack of training patients in reducing the many patient-centered risk factors that lead to delayed recovery, chronic pain, and in some cases, addiction. Chronic pain has emerged as a significant public health crisis, affecting millions worldwide and leading to considerable personal and societal burdens. Defined as pain lasting longer than three months, chronic pain can stem from various conditions, including myofascial pain, joint and skeletal disorders, neuropathic conditions, and headaches, among others. The widespread prevalence of chronic pain affects not only the individuals who suffer from it but also their families, workplaces, and healthcare systems. Understanding the multifaceted nature of chronic pain and exploring evidence-based solutions are crucial for mitigating its impact and improving individual and societal health outcomes. A solution to this crisis is to integrate prevention training and support for patients with pain conditions to reduce the risk factors that drive chronic pain and implement protective self-care actions that heal pain conditions. Prevention programs are greatly needed to be reimbursed and easily integrated into routine care similar to blood studies, urinalysis, and imaging. This paper describes the characteristics and implementation of prevention programs to prevent chronic pain and its consequences.

Introduction

Chronic pain is the top reason people seek care, the most common cause of disability and addiction, and the primary driver of healthcare utilization, costing more than cancer, heart disease, and diabetes [1-9]. The National Health Interview Survey (NHIS) found that 126 million adults (55.7%) experienced a pain condition with 20.1% having daily pain and 31.8% experiencing severe pain with over $600 billion in healthcare costs [7]. When the pain condition becomes chronic, it is associated with addiction, depression, missed work, disability, functional interference, and intensive use of high-cost high-risk interventions including opioid analgesics, multiple medications, and surgery [4-14]. These problems exist because over 50% of the people with common pain conditions continue to have pain five years later despite usual care treatment. This is often due to the presence of patient-centered risk factors that can lead to chronic pain. This delayed recovery is primarily due to many patient-centered risk factors that are not addressed in routine care such as poor ergonomics, repetitive strain, prolonged sitting, stress, sleep disorders, anxiety, depression, abuse, and many others that increase peripheral and central pain sensitization and lead to chronic pain and its consequences of disability, work loss, and addiction [14-18].

If limited 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 drive the pain condition. Yet, clinical trials have shown that the long-term outcomes of these passive interventions are poor 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 [12]. Thus, the National Academy of Medicine (2011) report on Relieving

Pain in America states that health professionals' primary role in pain conditions should be guiding, coaching, and assisting patients with day-to-day self-care to reduce these risk factors. However, this is rarely done as health providers lack the time, training, tools, and reimbursement to guide patients in self-care [1]. Healthcare providers need a strategy to provide consistent regular real-time support and training on self-care to their patients. This paper describes the background, development, and implementation strategy for Prevention Programs (PP) to prevent chronic pain and the opioid crisis.

Significance

The impact of chronic pain

Chronic pain is characterized by debilitating personal suffering that can lead to depression, anxiety, and decreased quality of life. Individuals report persistent discomfort and emotional distress, significantly affecting their mental health and overall well-being [41-45].

Chronic pain can severely limit an individual's ability to perform daily activities, work, and engage in social interactions. Many individuals report difficulties with mobility, self-care, and recreational activities, leading to increased dependence on others. The economic burden of chronic pain is staggering, with estimates suggesting costs exceeding $600 billion annually in the United States alone, accounting for healthcare expenses, lost productivity, and disability [8]. These costs underscore the urgent need for effective pain management strategies. Chronic pain is a leading cause of disability, limiting individuals' ability to work and engage in normative daily functions. The World Health Organization estimates that chronic pain leads to billions of lost workdays each year, contributing to a cycle of unemployment and poverty [19]. The healthcare costs associated with treating chronic pain are significant. Patients often incur high expenses for medications, therapy, and medical consultations. Surgical interventions for pain management can also drive costs even higher, with many patients seeking multiple treatment options. Chronic pain can lead to decreased productivity in the workplace. Individuals suffering from chronic pain often experience absenteeism and work while experiencing pain, leading to decreased effectiveness and economic loss for employers [20]. The societal implications of chronic pain extend into social conflict, as individuals with chronic pain often struggle with stigmatization and misunderstandings about their condition. This can lead to social isolation and conflict within personal and professional relationships, further exacerbating emotional and psychological burdens.

Preventing the 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 [5]. The prevalence of chronic pain has contributed to rising rates of opioid prescriptions, leading to alarming rates of drug misuse and addiction. In the U.S., an estimated 21-29% of patients prescribed opioids for chronic pain misuse them, contributing to the opioid crisis [21]. Many of these overdose deaths began with the use of prescription opioids by physicians and dentists for pain conditions. Since opioids are often blamed for this crisis, the solution most providers are currently implementing involves withdrawal and denial of the use of opioids for pain conditions. However, as access to opioid prescriptions tightens, consumers in pain increasingly are turning to dangerous street opioids, heroin, and fentanyl. Medication replacement strategies with less addicting opioids are another common strategy to help patients taper off the use of opioids but do not address the continued chronic pain that they may have. It is clear that a patient-centered multi-modal prevention program approach is needed to prevent both chronic pain and addiction behavior that includes both treatments as well as training of patients in self-management strategies to improve essential factors such as balance in mind, body, and emotions, motivation from having a purpose in life, social support, and healthy environments. Prevention programs provide patient self-management training with treatments to improve the pain with immediate treatment while addressing the risk factors that lead to chronic pain.

Prevalence and incidence of pain conditions

Chronic pain arises from various pain conditions including inflammatory diseases, traumatic injuries, degenerative conditions, and neuropathic disorders. Musculoskeletal disorders such as myofascial pain, fibromyalgia, osteoarthritis, and rheumatoid arthritis are the most common conditions involved in chronic pain [22,23]. The following conditions are the most common chronic pain conditions.

- Back pain affects approximately 540 million people globally at any given time. It is particularly prevalent among adults aged 30-50, with lifetime prevalence rates exceeding 80% with 25% of individuals having experienced back pain in the past three months, indicating persistent challenges in managing this condition [24,25].

- Headaches, including tension-type headaches and migraines, affect over 1 billion people globally [26]. Chronic migraine affects approximately 1% - 2% of the population, with individuals experiencing 15 or more headache days per month. This high prevalence leads to significant personal suffering and healthcare utilization, underscoring the need for effective management strategies.

- Temporomandibular joint disorder (TMJ) and other orofacial pain conditions impact 5% - 12% of adults

[27]. These conditions can lead to chronic pain, affecting eating, speaking, and overall quality of life. Women are disproportionately affected, and the incidence of TMJ pain often correlates with stress and bruxism (teeth clenching and grinding).

- Neck pain affects 30% of the population at some point in their lives, with a prevalence of 14.6% suffering from chronic neck pain [28]. Similar to back pain, neck pain can be influenced by factors such as poor posture, sedentary lifestyles, and stress.
- Shoulder pain has an estimated prevalence of 10-30%, particularly among people aged 50 and older [29]. Conditions such as rotator cuff injuries, adhesive capsulitis, and shoulder osteoarthritis contribute to this burden, impacting daily activities and quality of life.
- Hip pain, particularly associated with osteoarthritis, affects about 14% of individuals over 60 [30]. This type of chronic pain can limit mobility and significantly reduce overall functional status, leading to a diminished quality of life.
- Knee pain is highly prevalent in the aging population and impacts 22% of adults aged 50 and above [31]. Chronic knee pain often correlates with osteoarthritis, resulting in functional limitations and an increased risk of disability.
- Other chronic pain conditions, such as fibromyalgia, neuropathic pain, and complex regional pain syndrome, also contribute significantly to the burden of chronic pain. Fibromyalgia, for instance, affects an estimated 2% - 4% of the population, leading to widespread pain, fatigue, and cognitive impairment [13].

Risk factors increase chronic pain

An understanding of the multifaceted risk and protective factors involved in chronic pain is vital for healthcare professionals to provide comprehensive prevention strategies [32]. The following sections outline key risk factors impacting recovery and the development of chronic pain.

- **Genetic predisposition:** Genetics can influence pain sensitivity and the likelihood of developing chronic pain. Certain alleles associated with pain perception and inflammatory responses have been identified, such as variations in the COMT (catechol-O-methyltransferase) gene [33].
- **Injury:** Individuals with a history of injury and acute pain are more likely to experience prolonged recovery and the recurrence of pain [34].
- **Co-morbid medical conditions:** Chronic inflammation, autoimmune disorders, and metabolic diseases can complicate pain management and recovery. Conditions such as diabetes mellitus and rheumatoid arthritis are frequently associated with increased pain levels and prolonged recovery times [35].
- **Emotional distress:** Psychological and emotional variables such as anxiety, depression, and catastrophizing can significantly impact pain perception and recovery. Patients who exhibit high levels of negative emotional states often report exaggerated pain experiences and may be less likely to engage in proactive pain management strategies [35].
- **Pain-fear-avoidance beliefs:** Fear of re-injury or exacerbation of pain can lead to avoidance behaviors, limiting engaging in physical activity and contributing to deconditioning—ultimately risking prolonged pain and disability [36].
- **Socioeconomic status:** Lower socioeconomic status has been linked to a greater risk of chronic pain and delayed recovery. Factors such as limited access to health care, financial stress, and lower education levels can negatively affect health outcomes [37].
- **Poor social support:** The presence or absence of social support can influence an individual's coping mechanisms and pain outcomes. Strong social networks may facilitate recovery, while lack of support may contribute to feelings of isolation and exacerbated pain [38].
- **Physical inactivity:** Sedentary lifestyles are considered a significant risk factor for the development of chronic pain conditions, particularly in older adults. Lack of regular physical activity can lead to muscle weakening, joint stiffness, and an increased likelihood of pain recurrence [39].
- **Substance misuse:** The use of substances, including alcohol and opioids, can complicate recovery processes. Opioid dependence can mask pain and prevent appropriate treatment strategies from being employed [40].

Protective factors prevent chronic pain

The recovery process from pain conditions can significantly benefit from identifying and leveraging protective actions to enhance resilience, promote healing, and prevent the transition to chronic pain and its consequences. These factors encompass biological, psychological, social, and lifestyle elements that, when combined, form a holistic approach to pain management. The following outlines key protective

factors and actionable steps to facilitate recovery that can be included in prevention programs.

- **Regular exercise:** Structured stretching, strengthening, and aerobic exercise programs can support recovery by improving mobility, strength, and endurance while alleviating pain. Programs tailored to individual capacity and limitations maximize benefits and decrease the risk of re-injury [41-45].
- **Sleep hygiene:** Good sleep practices can reduce pain perception and improve overall health. Quality sleep is associated with better pain management, reduced fatigue, and improved emotional resilience, preventing chronic pain development [45,46].
- **Balanced nutrition:** A diet rich in anti-inflammatory foods—such as omega-3 fatty acids, fruits, and vegetables—can help manage inflammation and support recovery [47]. Proper nutrition also aids in maintaining a healthy weight, which can alleviate stress on joints.
- **Cognitive Behavioral Therapy (CBT):** CBT is effective in addressing negative thought patterns associated with pain. It helps individuals develop coping strategies, reduce anxiety, and promote positive behavioral changes that facilitate recovery [48].
- **Mindfulness and stress management techniques:** Practices such as mindfulness meditation and relaxation techniques can decrease stress levels and promote emotional regulation, thereby reducing the perception of pain [48-52].
- **Social support systems:** Engaging with supportive family, friends, and community resources can significantly enhance recovery. A strong social network can provide emotional support and encouragement, aiding in coping with pain and reducing feelings of isolation [53-55].
- **Access to multi-disciplinary healthcare resources:** Timely access to evidence-based healthcare and rehabilitation services is a critical protective factor. Early intervention by healthcare providers can facilitate timely treatment, while multidisciplinary approaches involving physical therapy, psychology, self-care training, health coaching, safe medication, and web-based interventions can enhance recovery outcomes [56-63].

Prevention is a priority

The US Health and Human Services (USHHS) Strategy to Combat Opioid Abuse, Misuse, and Overdose, the Institute of Medicine, and the Institute for Healthcare Improvement (IHI) share core principles to prevent chronic pain and its consequences [1-6]. They recommend integrating self-management strategies in routine care to engage, educate, and empower people in preventing chronic pain and addiction to achieve the IHI's triple aim of improving the patient's experience of care, enhancing the health of the patient, and controlling the cost of health care [64]. In addition, the IHI has added additional aims of workforce well-being and safety and advancing health equity that can be supported by prevention programs.

However, there are many barriers for health professionals to implement self-management training as part of routine care. The lack of reimbursement, time burden, lack of training, and the focus on preventive testing such as urinalysis and blood studies and passive treatments such as medication, injections, and surgery interfere with implementing self-management in clinical practice. Patient-centered Prevention Programs (PP) are designed to overcome these barriers and support the healthcare system in shifting to patient-centered strategies and early intervention of acute pain to prevent chronic pain [65]. PPs can also improve research data collection and analytics to inform a real-time public health response as the crisis evolves. PPs can conduct assessments of risk factors, protective factors, personal characteristics, and outcomes as close to "real-time" actionable data that can be used by healthcare professionals to personalize self-management and maximize efficacy. *An analysis of the cost impact of PPs has demonstrated that the total cost of care for patients with pain conditions can be reduced by 50% or more with an estimated minimum 8:1 annual return on investment (ROI) with long-term sustainability in future years* [66,67].

Methods

With funding from the National Institutes of Health, the Prevention Program (PP) was developed to implement in routine care. Initial research with the PP demonstrated positive recruitment, engagement, and improved pain and functional status in a randomized clinical trial [68-75]. This paper presents the development strategy, initial clinical outcomes, and reimbursement of the PP. The PP includes a prevention framework, telehealth coaching, a technology platform, and an implementation strategy to allow for easy integration into routine patient care and facilitate recovery from pain conditions to prevent chronic pain, addiction, and its consequences. Each is discussed.

Preventive framework

The Chronic Care Model (CCM) was used as the primary preventive framework for the PP [76]. The CCM has documented evidence of its efficacy for many chronic conditions in more than 100 healthcare organizations [77-

80]. The Prevention Program uses each of the 12 principles of implementing evidence-based self-management as part of routine patient care including; 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 easy to use format, 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 [76]. Using the CCM as a framework, the basic components of a PP including pain and risk assessments, immediate self-care for all benign pain conditions, and educational modules to provide patients with both understanding, rationale, reduction of the risk factors, and implementation of protective factors. This framework also supports biological health, mental health, social connections, and healthy lifestyle choices as part of a comprehensive prevention program.

Telehealth coaching

*Teleh*ealth coaches were used to support patients within the PP. They are trained with advanced health coaching degrees and can be nationally board-certified by the National Board of Health and Wellness Coaching (www.nbhwc.org). Health 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's relationship to the goal is up to the client. Telehealth Coaches collaborate directly with the referring provider as part of the interdisciplinary team for pain management similar to health psychologists and physical therapists. Telehealth Coaches are 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.

Systematic reviews of social support and health coaching show they improve functional recovery from chronic pain [81-85]. Health coaching provides a safe and consistent space to evaluate readiness for change and support positive change in health and well-being. 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 wellness. Health Coaching is a methodology that differs from health education, counseling, or therapy, though it can work well in combination with those other practices. Health Coaches assume that people have strong intrinsic resources and strengths, can access the self-motivation needed to function autonomously and competently, and are able to realize positive change within a safe and confidential alliance, where they are inspired, respected, and supported. By applying clearly defined knowledge and skills, they support individuals or groups in mobilizing their internal strengths and external resources to achieve sustainable changes in beliefs or behaviors. Health Coaching has the potential to help individuals, families, and groups achieve improved health and well-being with several strategies including setting goals, practicing grounding, mindful calming, facilitating mindset and lifestyle change, and empowering and engaging responsibly in achieving their 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, emotions, and behaviors to achieve their goal of improved health and wellbeing.

Patient Engagement Platform (PEP)

An online technology platform was developed to facilitate implementation and engagement in the PP using strategies from previous research in web-based care solutions [86-90]. The PEP at www.prevention program.com is accessible by online devices including computer and mobile apps with the following components:

- **Pain assessment:** Digitally delivered validated assessments review patient 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 review patient risk and protective factors in all areas of a patient's life, their readiness to change, and 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.

- **Online training modules:** Systematic reviews of studies evaluating each component of the PP including healthy habits, mindful pauses, and calming relaxation using online training have demonstrated clear evidence-based outcomes. For example, systematic reviews of randomized clinical trials of mindfulness-based stress reduction, web-based cognitive behavioral therapy, exercise, and lifestyle changes show significant improvement with chronic pain [91-98].

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- **Remote monitoring dashboard:** A dashboard presents data to health coaches, health professionals, patients, and support teams to better understand the personal characteristics of patients and track their progress. The dashboard includes the results of a 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 in both engagement in self-management as well as improvement in pain and interference.

- **Predictive data analytics:** Data algorithms and artificial intelligence leverage the data collected from the PP assessments and outcomes to identify the strategies, specific risk factors, and protective actions that can best improve long-term outcomes for a specific patient.

- **Artificial Intelligence (AI):** AI with the platform supports patient-centered engagement and self-care. AI is the simulation of human intelligence processes by computers using datasets, machine learning, and Natural Language Processing to improve education and engagement. Based on the pain and risk assessments, validated evidence-based recommendations for prevention and self-management are provided. Both provider and patient solutions via chat-based interaction can leverage and integrate clinical data and patient-centered data from psychometrically derived patient assessments. The data can also be analyzed for correlations and patterns using clinical decision-making to make predictions barriers and present care solutions to improve outcomes.

Implementation strategy

To expand the use of prevention programs, strategies were developed to easily implement PPs in routine care by providers [75]. After a comprehensive evaluation by the provider to establish the diagnosis and treatment plan for the pain condition, the following steps have been developed to facilitate the implementation of a prevention program in addition to treatment (Figure 1).

Training of health professionals in prevention: Training programs are available for both health professionals and health coaches at https://www.centerwithin.com/courses-with-michele/#CEapproved. In addition, the online course at www.coursera.org/learn/chronic-pain provides consumers and health professionals with a review of risk and protective factors for chronic pain conditions and supporting research [68].

Consumer awareness: Both consumers and health professionals can be made aware of prevention programs through journal articles, website search engine articles, social media, and clinic brochures for patients and referring doctors. Interested participants can review the website at www.preventionprogram.com which describes the benefits of participating in the prevention program and reviews from participants.

Figure 1: Components of the pain prevention program to provide on-line personalized assessments and coach-supported training (PACT) to engage in prevention as part of daily activities.

Shared Decision-Making (SDM): SDM is a collaborative process where patients and providers work together to make informed choices about the best treatment options [99]. This approach emphasizes the patient's values, preferences, and individual circumstances alongside clinical evidence and expertise to facilitate a dialogue that leads to a joint decision including prevention. By empowering patients to participate actively in their care, SDM enhances patient satisfaction, promotes adherence to treatment plans, and can lead to improved health outcomes.

Order set for Electronic Health Record (EHR): Providers who choose to engage their patients in a prevention program can prescribe PP with a simple EHR order set. This will send a message to the patients to schedule their first visit to begin the process of self-management preventive care.

Speed to treat self-care for acute pain conditions: Timely self-care interventions are provided by the PP to begin the healing process for acute pain conditions. These recommendations can significantly address acute pain and prevent the transition from acute to chronic pain to improve long-term outcomes [88].

Avoid opioid medication: To combat the opioid crisis, it is crucial to focus on non-opioid interventions for managing chronic pain. Approaches such as physical therapy, cognitive-behavioral therapy, acupuncture, and mindfulness can provide effective alternatives to opioids [91].

Shift to patient-centered concepts: The PP will help the patient, health professional, and the health care system shift

to patient-centered clinical paradigms that facilitate patient engagement and empowerment in self-management resulting in improved long-term outcomes (Table 1).

Provide whole-person care: *The* PP can help implement whole-person care to enhance the effectiveness of pain management strategies. Integrating physical, cognitive, emotional, spiritual, lifestyle, social, and environmental, aspects of health in treatment plans fosters comprehensive management that addresses underlying issues contributing to chronic pain [90].

Enrollment and initial visit: Participants can enroll in the PP either through self-referral to the website or through their health care clinic. Participants can enroll in the PP using the registration process at www.preventionprogram.com. At the health coach evaluation, the health coach will review the participant's past history and diagnoses, ask the patient what their goals are, and introduce them to the PP. The HC will review the PP to help the patient focus on achieving their goals by reducing risk factors through protective actions in each of the seven realms of the person's life. To bill the visit through a health plan, participants will also be scheduled with the PP's physician to evaluate and explain the program. At the physician evaluation, the physician will review the patient signs and symptoms, past history, and diagnoses, confirm the diagnoses, review criteria for participation in the PP, and provide initial preventive medicine counseling to help the patient begin self-care and healing the pain condition. The physician will then schedule a 3-month follow-up to monitor patients' engagement and success in the PP.

Simple action plans: An action plan that is generated for each module includes 3 components: Healthy HABITS, daily PAUSEs, and CALMING practice. These action plans are different to address risk factors for each realm of a person's life including the mind, body, lifestyle, emotions, motivation, social life, and environment. Overcoming barriers are also discussed to help complete the action plans. The PP has many resources that provide written handouts for each lesson including an action plan summary, a daily log, and worksheets for each lesson.

Support by family and friends: Having friends or family team members who can support participants and encourage them along their journey. Each participant can sign up their supporters at the beginning or at any time using the team link of the dashboard. Supporters will then receive communication on how to support the patients in the PP.

Tracking participant engagement: Once the participant confirms their interest and is enrolled by the health coach, the participant can access the PP digital Patient Engagement Platform (PEP) including the interactive website. The PP will send out reminders to the participant to reinforce success and encourage completion of the program. The health coach will also schedule visits at 1 every 2 weeks intervals with the patient over the next months to complete and implement the whole program. The health coach communicates to the referring physician with regular documentation for billing. The visit times are typically scheduled each week at the same time and day of the week. Reminders from both the PP platform and EHR can encourage patients to engage in the program. Patients are sent monthly progress assessments to track engagement and progress in achieving the patient's goals. The Health coach will then review the progress to determine engagement in self-care, change in risk factors, overcome barriers, and improvement in the condition.

Documentation and billing: To bill through the participant's health plan, providers who refer to the PPs can bill through the clinic's EHR with all necessary documentation

Table 1: The success of Prevention Programs is based on health professionals shifting to broader patient-centered concepts and self-management integrated with treatment using shared decision-making.

Concept	Description and presenting the concept to the patient
Self-care training integrated with treatment	We are happy to provide treatment for your pain condition but it is more effective long-term if we also train you to reduce the causes of the pain. *Are you interested?*
Diagnoses, risk factors, and treatment planning to address both	Based on the assessments, you have specific physical diagnoses that cause your pain and symptoms as well as risk factors that delay healing and recovery. The treatment plan will improve the pain long-term while helping you reduce the lifestyle causes of the condition.
Understand the whole person	We can help you identify all conditions, risk factors, and protective factors in the 7 realms of your life to shift the balance from pain and illness to health and well-being. *Are you willing to do self-assessments?*
Each person is complex	Multiple conditions and interrelated contributing factors may initiate, result from, increase risk, or decrease the risk of illness. *Are you willing to address each?*
80/20 Rule	Self-responsibility is your key to recovery. You have 80% influence on your problem and treatments provide about 20% impact. *Will you take control of the condition?*
Self-care	You will need to make daily changes in order to improve your condition. *Are you willing to take the time to do this?*
Education and training	We can train you on how to make the lifestyle changes that will improve the condition long-term. *Are you willing to learn it?*
Long-term change	Change occurs gradually over time and it may take months to have a large impact. *Are you patient and persistent to see success?*
Personal motivation	It takes a commitment to a daily action plan to have success. *Are you motivated to take daily steps to improve your pain and health?*
Social support	You may need help from a health coach, family, and friends to make these lifestyle changes. *Are you open to receiving help from coaching, family, and friends?*
Change process	Change and improvement will occur in small steps incrementally over time. *Will you be patient with progress and notice the gradual change?*
Fluctuation of progress	Expect ups and downs during the recovery process. *Are you resilient and determined enough to overcome the ups and downs?*

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provided by the health coach. Health plans including Medicare and Medicaid recognize the value of prevention and have supported prevention programs using different CPT codes and documentation [92]. This includes reimbursement for Preventing Substance Misuse (CPT 99408,99409), Behavioral Health Management Support (CPT 90792, 90834, and 90837) and Chronic care management (CPT G0506, 99487, G2065, and 99358).

Results

Using the above multi-level strategy, the preventive program was developed and implemented with 604 patients. Table 2 provides the structure and content of the program. Patients were introduced to the Prevention Program within a clinical setting with the simple request; "I am happy to provide treatment but it is more successful long-term if we also support you in reducing the causes of the pain. Are you interested?" With this question, most patients who were introduced to the PP wanted to participate. PP was implemented in three phases with shared decision-making at each visit including; 1) Initial patient-centered focused clinical evaluation with treatment planning, 2) PP implementation with assessment and telehealth coaching, and 3) Follow-up visits including preventive medicine counseling.

A random sample of 30 of these patients was evaluated with regard to outcomes from the EHR. Table 3 presents the pre- and post-data that were collected for pain severity, personal impact, life interference, and prior healthcare use. In addition, data was collected for the mean number of medications taken for their condition, healthcare visits, healthcare use, and healthcare costs.

We also evaluated the 604 patients enrolled in the PP to determine reimbursement by health plans using Screening, Brief Intervention, and Referral to Treatment (SBIRT) for preventing chronic pain and substance misuse. The CPT codes and percent reimbursement are provided in Table 4. The estimated fees billed out for the 6-month pain management

Table 2: Structure of Patient Services in the Prevention Program.

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, a progress dashboard, and resource handouts to help patients heal and recover from pain conditions.	
Clinic Actions: Provider completes evaluation, diagnosis, and treatment plan including PP self-care training and coaching support. If consenting, the provider refers the patient to the PP team using an EHR order set. The staff enrolls the patient in PP and schedules the 1st telehealth coach visit. The patient receives an email from the Coach auto-connects with the patient and accesses the PP platform. The patient consents to the terms and begins PP assessments, training modules, and telehealth coaching sessions. 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.	
PP Assessments and Training Modules Assessments are completed and reviewed by the coach and provider to understand and personalize training and support. Progress on learning modules is self-directed by the patient.	**PP Telehealth Coaching Sessions** 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.
Introduction to PP Module: Overview of learning modules in PP Program and telehealth coaching. The patient **completes assessments:** including current pain, severity, previous care, goals, coping strategies, risk factors, and protective factors. No patient fee.	**Orientation:** Discuss the Prevention Program with learning and health coaching. Discuss the background, rationale, timetable, whole-person risk factors, and goals of the program. Assess readiness for change and interest in engaging in a self-management program.
Understand Pain: Learn about the causes of chronic pain and how treatment with self-care can heal pain long-term. Pain Assessment is reviewed to understand risk and protective factors to relieve pain.	**Big Picture Goals:** Review Pain and Risk Assessment with the patient. Explore overall vision and goals for preventing chronic pain and addiction while encouraging a healthy life within the 7 realms.
Immediate Self Care: 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.	**Pain Cycles:** Review Assessments with the patient. Coach reviews how pain, risk factors, and pain cycles drive pain, and protective self-care actions and treatments to heal pain.
Mind Modules: Learn how a positive mindset, thoughts, and attitudes can improve pain. Mind Assessment was reviewed to identify thoughts and attitudes that impact pain.	**Mind:** Review assessments and provide coaching support for goals and how optimism, self-efficacy, realistic expectations, and resilience help recovery from pain.
Body Module: Learn how the use of the body with exercise, posture, and reduced strain to improve pain. Body Assessment reviewed for how body use impacts pain and recovery.	**Body:** Review Body Assessment with the patient. Provide coaching support for goals and for implementing optimal posture, stretching, exercise, and reducing straining to impact pain.
Lifestyle Modules: Learn how to improve daily behaviors of diet, sleep, substance use, and pacing to improve pain**.** Lifestyle Assessment reviewed including diet, sleep, substance use, and pacing impact pain and recovery,	**Lifestyle:** Review the Lifestyle Assessment with the patient. Providing coaching support for goals and implementing an anti-inflammatory diet, restful sleep, balanced pacing, and limiting substance use can impact pain.
Emotions Modules: Learn how emotional coping and processing impact pain and recovery. Emotion Assessment reviewed including positive and negative emotions that impact pain & recovery,	**Emotions:** Review the Emotions Assessment with the patient. Provide coaching support for goals and understand emotions, cope with negative emotions, and shift to positive emotions to impact pain.
Motivational Spirit Modules: Learn how motivation, purpose, and meaning can impact pain and recovery. Spirit Assessment reviewed including motivation, hopes, and determination impact pain and recovery.	**Spirit:** Review Spirit Assessment with the patient. Provide coaching support for goals and understanding the role of purpose, self-compassion, hopes and dreams, and determination in recovery from pain.
Social Life Modules: Learn how social connections and support can impact pain and recovery. Social Assessment reviewed and how relationships impact pain & recovery.	**Social:** Review Social Assessment with the patient. Provide coaching support for goals and understand how social belonging, positive support, and relationships impact pain.
Environment Modules: Learn how living safely within the world around impacts pain & recovery. Environmental Assessment reviewed with safety factors impacting pain and recovery.	**Environmental:** Review the Environment Assessment with the patient. Provide support for goals and safety in the environment that you live, work, and receive care in and how to prevent re-injury.
Living in whole health: Integrating a whole health plan to prevent pain and its consequences. Final Assessments and outcomes are reviewed.	**Final Session:** Review the Final Assessment with the patient. Provide support with takeaways, progress, resources, and goals beyond the Prevention Program.

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Table 3: PP Date from Electronic Health Records (n = 30) with mean age 32.7 years, 70% female). Patients had a mean of 3.3 modules viewed and 5.7 Coach visits.

Measure	Mean Pre-status[1]	Mean Post-status[2]
#1 Pain Severity Score (0-10)	6.8	3.5
#2 Pain Severity Score (0-10)	5.1	2.2
Interference in Life (0-10)[3]	5.7	2.6
# of Medications taken for the condition	5.8	1.5
Healthcare visits during 3-month period[4]	9.8	3.6
Healthcare use (# of different treatments & tests used in past)[5]	9.4	N/A
Past and current healthcare cost for pain condition	$32,220[6]	$3,110[7]

[1]At initial evaluation.
[2]During 3 months follow-ups after pain program including PP training, physical therapy, splint, and medication.
[3]How much has it interfered with daily activities (0-none to 10-extreme)?
[4]Number of different medications taken at intake versus in the past month.
[5]Healthcare use of includes the number of 35 different treatments and tests that the patient had undergone excluding office visits.
[6]Prior cost of healthcare based on mean costs for treatments and tests estimated at $3,540 per unit. This is comparable to costs for chronic pain patients in several studies including Park et al Pain Practice, 2016 and Gaskin and Richard, The Institute of Medicine. National Academies Press; 2011.
[7]Post-status includes the mean total cost of pain program with PP, coaching, preventive counseling, splint, office visits, and physical therapy.

Table 4: In-network reimbursement Rate of CPT codes by health plans for preventive medicine and substance misuse.

Description of procedure	cpt code	# claims processed	% of claims paid	Fee submitted	mean fee paid	In-network collection rate
Preventive medicine counseling by provider at follow-up visit (<15 min)	99401	690	93%	$75	$47	63%
Preventive medicine counseling by provider at initial visit (15-30 min)	99402	352	89%	$110	$99	89%
PP services for Health Coaching (30 to 60 min).	99409	403	90%	$165	$100	61%
PP services for Risk Assessment/ and Training	99409	403	90%	$165	$100	61%
Total		1,805	90%	NA	NA	71%

program with an estimated 20 visits generate revenue for the clinics. Table 4 presents the data from 1,684 claims submitted for PP reimbursement showing a mean 71% in-network reimbursement rate. However, health plans continue to change their reimbursement policies and these codes may not be reimbursed as well in the future. We are currently working with health plans to reduce denials and improve reimbursement.

Discussion

Chronic pain self-management programs have gained traction as effective strategies for empowering patients to manage their pain, improve function, and enhance quality of life. These programs typically focus on pain education, cognitive behavioral change, stress management, and peer support.

Structured education programs provide information about the nature of pain, pain mechanisms, responsible medication management, coping strategies, the role of physical activity, the importance of self-monitoring, and other information [100]. The knowledge about pain and its management can improve understanding and ability to cope while reducing anxiety. Participants often report decreased pain intensity and disability. The effectiveness may depend on the quality of the educational content and the participant's engagement.

Cognitive Behavioral Therapy (CBT) approaches help patients modify negative thought patterns and pain behaviors to develop problem-solving skills for improved coping with pain. These can be delivered in group settings or one-on-one with trained therapists and may also include online formats. Studies have reported reductions in pain intensity, emotional distress, and improved coping strategies and functional status [101-103]. CBT requires access to trained therapists and can be time-intensive with outcomes varying based on individual engagement and motivation.

Stress reduction strategies can also improve chronic pain by incorporating mindfulness practices, yoga, and meditation to increase awareness of risk factors and promote relaxation. They are often delivered in group settings or through mobile applications and online platforms. They have shown significant improvements in pain perception, stress levels, emotional well-being, pain-related anxiety, and quality of life [103,104]. Similar to other self-care strategies, it requires discipline and regular practice with outcomes that vary based on individual responsiveness.

Another prevention strategy involves the use of peer support within community programs. These facilitate connections between individuals experiencing similar pain conditions through support groups or online forums with peer facilitators [105]. The focus is on sharing experiences, advice, and encouragement among participants to reduce feelings of isolation and improve coping strategies. Participants often report feeling more empowered and less distressed. Success can depend on the quality of the group dynamics and the commitment of the participants.

Patient-centered technology platforms have been used in chronic pain programs and allow for assessments, education modules, progress tracking, and virtual counseling sessions. Users report Increased accessibility and adherence; high satisfaction with reduced pain intensity and improved self-efficacy [106-110]. This solution requires technological literacy and access to the necessary technology.

Each of these strategies has been included in the Prevention Program to provide a more comprehensive solution that is supported with technology with access by computer, mobile apps, telehealth, and online platforms. However, the implementation of comprehensive self-care training to prevent chronic pain by any healthcare providers including physicians, dentists, physical therapies, mental health professionals, and public health policymakers requires a solution that is easy to implement, adds minimal time to the daily schedule, improves patient outcomes and satisfaction, and be reimbursed by health plans. The use of the code CPT 99409 (SBIRT) to provide Screening, Brief Intervention, and Referral for Treatment to prevent chronic pain and associated substance misuse has been supported by most health plans. Both Chronic Care Management (CCM) and behavioral Counseling codes can also be reimbursed as part of prevention programs. Revised rules for 2020 brought new payment opportunities for CCM. Services based on CCM can include behavioral health integration and principal care management with fees billed by the referring healthcare provider since the care is an extension of the provider's care and health coaching is under direct supervision and collaboration in managing the pain problem.

The experiences of Jessica, a 28-year-old healthcare worker can help understand the development and successful management of pain conditions. Jessica had neck and shoulder pain, migraine headaches, and a temporomandibular pain disorder since her teen years. Recently, she was verbally abused at work because of her poor performance, which led to post-traumatic stress, anxiety, depression, and more pain. In addition, her work position in a medical center call center forced her into poor posture with repetitive strain from talking, clenching her teeth, and extending her neck most of the day. The pain kept her up at night and her resultant fatigue, high caffeine use, and tensing caused more pain and headaches. When the pain flared, she went to urgent care to help her control the pain and was prescribed anti-anxiety, anti-depressants, and opioid pain medications for years. She often over-used these medications with side effects. Because of the persistent pain and anxiety, she requested a 3-month medical leave to recover from the pain and stress at work. She had many pain cycles that were sustaining her pain. Then, she was referred to the pain clinic that included a 4-month prevention program supported by a health coach to understand the big picture of what was causing her pain and how to reduce the risk factors that were driving her pain cycle. By becoming empowered and engaged in her own health, she was able to maintain her healthy habits (exercise, posture, diet, sleep), pauses (mindfulness), and calming practices (relaxation) each day. She gained confidence in self-managing her own pain and was able to shift away from medication and passive treatments. She returned to the workforce with a job that she enjoyed and avoided repetitive strain. She is also much happier with better relationships and a brighter future.

Other patients who have participated in the prevention program have provided comments to share. Kathy age 38 years with years of headache and neck pain stated, "PP was the most valuable part of my treatment plan and taught me many self-management strategies that do regularly to relieve and prevent my pain." Monica, aged 24 years with chronic facial pain commented, "PP has provided me confidence that I can self-manage my pain with some simple strategies and avoid the ongoing treatments and medications for pain that I have used for years." Zoe, age 62 with chronic headaches, neck, and shoulder pain commented, "PP is incredibly helpful. I expect that in 10 years every doctor in the country will be using PP as part of their treatment for pain." Steve is a 71-year-old male with 20 years of chronic pain and 10 years of daily opioid use. "I am off opioids in the past 3 weeks for the first time in years because I learned how to manage the pain myself. The health coaching has been great and I practice calming and stretching every day. It works to reduce my pain." Marlene is a 76-year-old female with severe pain from being hit by a car 2 years ago. "Each PP lesson is so valuable to help me reduce my pain. I print out each handout and take notes from each lesson. I follow the action plan daily and it works. The coaching has been also so helpful. I am now able to manage my pain." Lisa, 17 years of age had severe pain in the jaw, head, and neck for the past 2 years. During her initial conversation with her health coach, she said pain was so severe, she could not take it anymore and considered suicide. She recovered and provided this comment. "The self-care has helped my pain so much and I'm not feeling sad about it anymore. Thank you."

Summary

Chronic pain and other chronic illnesses are 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. The National Academy of Medicine (2011) report on Relieving Pain in America recommends 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 using the transformative care model. Chronic pain prevention programs employ a variety of strategies, each with unique outcomes. Evidence suggests that preventive self-management programs

can significantly empower individuals to successfully manage their chronic pain. While these programs yield positive results, the effectiveness and engagement can differ among individuals based on accessibility, engagement, and personal motivation. The Prevention Program (PP) has been developed and tested in randomized clinical trials and now in this case series. The studies demonstrate that preventing chronic pain and its consequences can be accomplished by providing patient-centered personalized training with telehealth coaching. Digital patient engagement platforms also support prevention programs with assessments, AI-supported participant engagement, risk-reduction training lessons, telehealth coaching, remote monitoring, and self-management support. Prevention programs are ready for broad-scale implementation and dissemination to identify broad-scale outcomes, overcome barriers, and successful reimbursement by health plans.

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