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Stepped Care Models for Chronic Pain

CADTH

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Abbreviations

CBT	cognitive behaviour therapy
CINAHL	Cumulative Index to Nursing and Allied Health Literature
ESCAPE	Evaluation of Stepped Care for Chronic Pain
MeSH	Medical Subject Headings
NCCP	Non-cardiac chronic pain
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	randomized controlled trial
SCS	Stepped Care Strategy
SCM-PM	Stepped Care Model for Pain Management

Key Messages

- CADTH included 6 reports describing the potential clinical benefits of 5 stepped care models for chronic pain in this review.
  - The randomized controlled trial of the stepped care model for patients who are overweight or obese with chronic pain due medial tibiofemoral osteoarthritis described the impact on pain remission, pain intensity, and function.
  - The before-after and retrospective cohort study of the Stepped Care Model of Pain Management described the effects on pain, quality of chronic pain care, pharmacotherapy use, and health care utilization in US veterans.
  - The before-after study of the biopsychosocial stepped care model for non-cardiac chest pain described the potential benefits on chest pain, depression, anxiety, quality of life, and health care use.
  - The prospective cohort study of the Stepped Care Strategy compared a cohort of patients who received stepped care strategy-consistent care for hip or knee pain due to osteoarthritis with a cohort who received stepped care strategy-inconsistent care and described the results on pain physical function, self-efficacy, active pain coping, and health care use.
  - The Evaluation of Stepped Care for Chronic Pain randomized controlled trial described the effects on pain, disability, and pharmacotherapy use in US veterans.
- CADTH included 1 cost-effectiveness analysis that described the cost implications of a stepped care pathway for treating sciatica pain.
- While all included models used a stepped care approach to chronic pain management, the models were customized, and the evaluation methods were heterogeneous.

Background

Chronic pain is generally defined as pain lasting for 3 months or longer or persisting beyond the time needed for normal tissue healing.[1] It can affect the sufferer's quality of life and can lead to substantial physical and psychological morbidity.[2] One in 5 Canadians lives with chronic pain, and it is 1 of the most common reasons that Canadians seek medical attention. The economic burden is substantial.[2] In 2019, between $15.1 and $17.2 billion in estimated direct costs were associated with managing chronic pain in Canada.[3]

Because chronic pain is difficult to cure, the goal of treatment is to control pain, maintain function, maximize coping, and prevent disability, and often involves a multidisciplinary pain management plan.[1,4] CADTH conducted an Environmental Scan in 2021 to compile information on the models of care for chronic pain and chronic non-pain-related medical conditions being used in Canada and in other countries.[5] One of the 3 priority models of care of interest in the Environmental Scan is the focus of the current review.

With stepped care, interventions that are used to manage chronic pain are organized into a series "steps" placed on a continuum from lowest to most intensive based on a variety of characteristics, including the facility's level of care (e.g., primary, secondary, and tertiary care centres), type of care provider (e.g., education modules, workshops, individual therapies), treatment needs, patient effort, level of health care provider contact, and cost.[6,7] Patients are initially offered the least intensive intervention that takes into account the nature, duration,

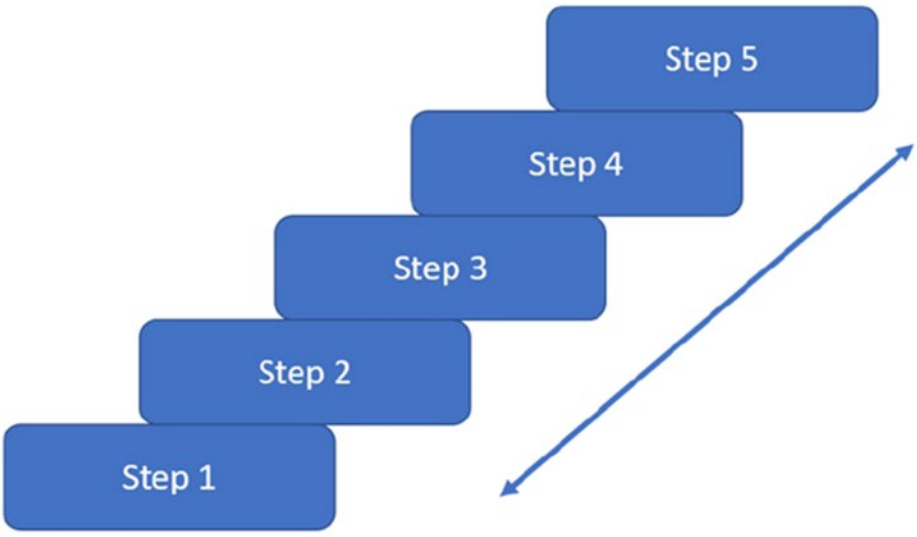
severity and course of symptoms. Immediate access to this first level of care may meet the needs of a considerable portion of the chronic care population and has the potential to alleviate wait lists for patients who need higher levels of specialized care. The progression of symptoms and treatment outcomes are routinely monitored, and subsequent individual treatment efforts are adjusted and stepped up or down, until treatment goals are met.[7,8] Figure 1 presents a simplified diagram of a stepped care.[5]

The CADTH Environmental Scan[5] identified 4 stepped care models for chronic pain and 9 stepped models for other medical conditions (mental health and insomnia). The Environmental Scan also summarized the main categories of patient-related outcomes associated with models of care delivery for patients with chronic pain: pain (e.g., intensity and interference), psychosocial (e.g., coping, depression, anxiety, distress, and fear), function (e.g., disability and employment status), and health care use (e.g., prescription of any opioid, long-term opioid therapy, frequency of primary care visits, and number of visits to specialty health care services).

Stepped care programs have demonstrated clinical benefits for other conditions, such as depression and anxiety.[9,10] In previous reviews of studies on stepped care models for chronic pain the authors reported positive results on pain, disability, general and physical health, depression, and anxiety.[11,12] Preliminary findings from a 2020 report on the implementation of a stepped care program in Ottawa, Canada suggested that wait times for access to chronic pain programs may be considerably reduced with a stepped care approach.[13] The current review aims to describe the available literature on the potential clinical benefits and harms of using stepped models for the management of chronic pain.

Stepped care models are designed to maximize the match between health care needs and interventions, while minimizing care costs.[6] The cost-effectiveness of a stepped care model was shown in people with a depressive disorder in primary care.[14,15] A 2010 economic evaluation[16] explored the incremental benefit and incremental health services cost of a

Figure 1: Simplified Diagram of a Stepped Care Model



Source: Brett K, MacDougall D. CADTH Health Technology Review Models of Care for Chronic Pain. Ottawa, ON: CADTH: https://www.cadth.ca/sites/default/files/es/ES0350%20_to%20Publishing%20Final.pdf. Accessed 2022 Mar 22.[5]

stepped care intervention in US veterans with chronic pain. The authors reported that the stepped care model resulted in more pain disability-free days compared with usual care. The stepped care group also had significantly higher costs than the usual care group, which the authors claimed were likely attributable to the cost of stepped care as well as changes in treatment due to its implementation.[16] Another aim of the current review is to describe the available literature on potential cost implications of using stepped care models for the management of chronic pain.

Objectives

The key objectives of this CADTH review are as follows

1. Identify and summarize literature on the potential benefits and harms of stepped care models of care for chronic pain.
2. Identify and summarize literature on the potential cost implications of stepped care models of care for chronic pain.

The focus of this review is to summarize what literature exists on the clinical benefits, harms, and cost implications of stepped care models for chronic pain. Since chronic cancer pain and chronic non-cancer pain are distinct entities, as evidenced by unique clinical practice guidelines for each, this review focuses exclusively on chronic non-cancer pain.[17,18] This review does neither includes a formal critical appraisal of the literature, nor is it a formal program evaluation. Thus, making conclusions or recommendations about the value of stepped care models for chronic pain are outside the scope of this review.

Research Questions

1. What literature describes the potential clinical benefits and harms of providing care using stepped care models for the management of people with chronic non-cancer pain?
2. What literature describes the potential cost implications of providing care using stepped care models for the management of people with chronic non-cancer pain?

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycInfo, the Cochrane Database of Systematic Reviews, the International HTA Database, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were stepped care model and chronic pain. No filters were applied to limit the retrieval by study type. The search was limited to English language documents published between January 1, 2012 and April 1, 2022.

Selection Criteria

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text reports was based on the inclusion criteria presented in Table 1.

Chronic non-cancer pain and other disorders or diseases (e.g., mental health conditions, multiple sclerosis, and stroke) frequently occur together.[19,20] Reports were included if the population included people with chronic non-cancer pain, regardless of the presence of other disorders or diseases. However, reports were excluded if the target population was people with the associated disorders or diseases only and there was no specific mention of addressing chronic pain jointly.

Synthesis Approach

Information from the relevant studies was extracted into tables and organized by objective by 1 reviewer. The information was then used to structure and inform the current review. Narrative summaries of the literature were presented separately for each stepped care model. Data were extracted on the model components and implementation; evaluation methods; and findings that related to potential clinical benefits and harms, and potential costs. The limitations of each study were also described, as reported by the study's authors. No formal critical appraisal (e.g., risk of bias assessment) of the included studies was conducted.

Summary of Evidence

Quantity of Research Available

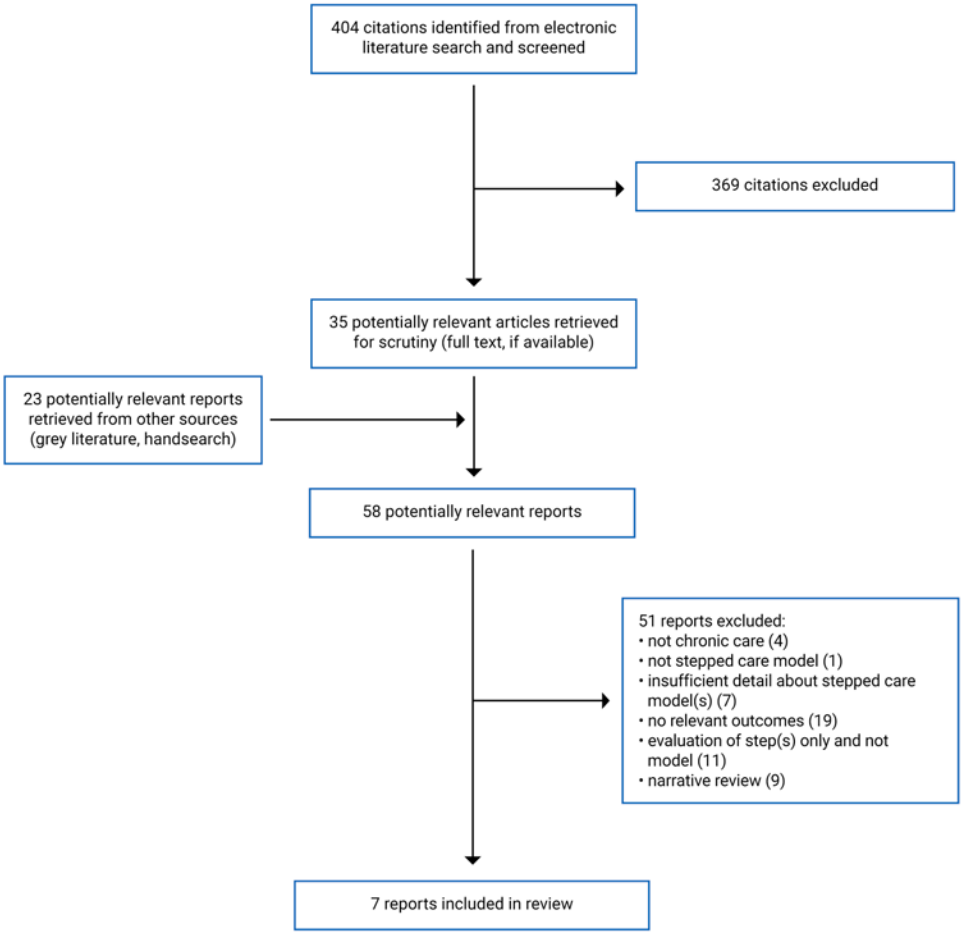
A total of 404 citations were identified in the literature search. Following screening of titles and abstracts, 369 citations were excluded, and 35 potentially relevant reports were retrieved for full-text review. An additional 23 potentially relevant reports were retrieved from the grey literature search for full-text review. Of the 58 potentially relevant reports, 51 were

Table 1: Selection Criteria

Criteria	Description
Population	People (of any age) with chronic non-cancer pain in outpatient settings of publicly funded health care facilities
Intervention	Care provided using stepped care models
Type of information	Q1: Descriptions of potential clinical benefits (e.g., pain, physical function, sleep, social function, emotional and psychological functioning [e.g., anxiety, depression], health-related quality of life, changes in use of pharmacotherapy [e.g., opioids]) and harms (e.g., hospitalizations, substance use, adverse events) Q2: Descriptions of potential cost implications (e.g., budget impact, cost savings, economic benefits to individuals or health systems)
Study designs	No restrictions on study design or type of report
Search time frame	10 years

excluded. In total, 7 reports of 6 studies (2 randomized controlled trials [RCTs][21,22] and 4 non-randomized studies [1 prospective cohort,[23] 1 retrospective cohort,[24] and 2 before-after studies],[25,26]evaluating 5 stepped care models and 1 report of 1 economic evaluation of a stepped treatment pathway[27]) were included. Figure 2 presents the PRISMA flow chart of the study selection.[28]

Figure 2: Selection of Included Studies



Reports of studies that evaluated 1 or more steps in the stepped care approach, rather than the implementation and evaluation of the stepped care model itself, were beyond the scope of this review and not included. A list of these reports is presented in Appendix 1.

Guidelines that made recommendations regarding the implementation of stepped care models for chronic pain were outside of the scope of this review but are listed as documents of potential interest in Appendix 2. Other reports of potential interest that were identified in the literature search but did not meet our inclusion criteria are also listed in Appendix 2.

Objective 1: Identify and Summarize Literature on the Potential Benefits and Harms of Stepped Care Models of Care for Chronic Pain

Six studies reporting on 5 stepped care models for chronic non-cancer pain[21-26,29] were included in this review. Each study described the implementation, evaluation, and potential benefits of a specific stepped care model.

One of the studies[21] described the potential harms of a stepped care model.

In the following sections, each stepped care model is presented. Details of the model components and implementation, evaluation methods, and relevant findings are presented in individual tables, and briefly summarized narratively. The limitations of each study as reported by the authors are also described. The models are presented in reverse chronological order of their publication dates (i.e., most recent publication is presented first).

Stepped Care Model in People With Excess Body Weight and Knee Osteoarthritis

One RCT evaluated a stepped care strategy for people aged 50 years and older with excess body weight and chronic pain due to medial tibiofemoral osteoarthritis.[21] Characteristics of the stepped care model and RCT are presented in Table 2 and Table 3. Study participants in the intervention arm received stepped care. The first step in the model involved 18 weeks of a diet and exercise program. In the second step, patients in remission continued with diet and exercise. Disease remission was defined as symptomatic remission of pain plus decrease in disease activity and/or symptomatic remission of functional impairment, as assessed by the Patient Acceptable Symptom State. If remission was not achieved, participants were assigned to cognitive behavioural therapy (CBT), knee brace, or muscle strengthening for 12 weeks, depending on their clinical presentation for symptoms of depression and varus malalignment. The comparison group received education material about the management of knee osteoarthritis. The researchers who enrolled and assessed the study participants were blinded to group allocation. The participants, study coordinator, therapist delivering the strengthening exercises, and statistician were not blinded.[21]

Table 2: Characteristics of Stepped Care Model for People with Excess Body Weight and Knee Osteoarthritis[21]

Characteristic	Description
Model, country	Stepped care model for people who are overweight or obese with chronic pain due to medial tibiofemoral osteoarthritis, Australia
Model components	
Step 1	Diet and exercise regime (18 weeks) based on Healthy Weight for Life program • 3 phases of 6 weeks each: motivational weight loss, consolidation phase, short-term maintenance phase • Evaluation at 20 weeks using PASS to determine Step 2

Characteristic	Description
Step 2	1 of 4 treatments (12 weeks) • Diet and exercise maintenance (if disease remission achieved) • Online CBT (if depression sub-score of DASS 21 was ≥ 14 [out of a maximum of 21]) • Knee brace (if varus malalignment was ≥ 6 degrees on the mechanical axis) • Muscle strengthening exercises (no depression or varus malalignment) including 6 supervised sessions and home-based exercises
Implementation details	NR

CBT = cognitive behavioural therapy; DASS 21 = Depression, Anxiety, and Stress Scale – 21 items; NR = not reported; PASS = Patient Acceptable Symptom State.

Table 3: Characteristics of RCT Evaluating the Stepped Care Model for People With Excess Body Weight and Knee Osteoarthritis[21]

Characteristic	Description
Study design	RCT
Setting	1 hospital in Sydney, Australia
Enrollment period	July 2015 to April 2017
Funding sources	• The National Health and Medical Research Council • The University of Sydney
Inclusion criteria	Patients ≥ 50 years of age, BMI ≥ 28 kg/m^2, radiographic evidence of predominantly medial tibiofemoral osteoarthritis, pain intensity ≥ 40 of 100 on VAS, scores above PASS cut-off value for patient global assessment of disease activity, functional impairment ≥ 31 of 100 on WOMAC function subscale
Sample characteristics	• Intervention, N = 87 • Mean age (SD): 62.5 (7.4) years • Female: 66% • Median pain intensity score: 61.0 (range: 50.0 to 70.0) on VAS (0 to 100, higher = more pain) Comparison (educational pamphlets), N = 84 • Mean age (SD): 63.8 (7.3) years • Female: 62% • Median pain intensity score: 61.5 (range: 50.0 to 77.5) on VAS (0 to 100, higher = more pain)
Relevant outcomes	• Disease remission (remission of pain in addition to remission of patient global assessment of disease activity and/or functional impairment, PASS) • Pain intensity (VAS) • Functional impairment (WOMAC function subscale) • Depression (DASS 21) • Adverse events
Follow-up	32 weeks

BMI = body mass index; DASS-21 = Depression, Anxiety, and Stress Scale – 21 items; PASS = Patient Acceptable Symptom State; RCT = randomized controlled trial; SD = standard deviation; VAS = visual analogue scale; WOMAC = Western Ontario and McMaster Osteoarthritis Index.

The findings of the RCT are presented in Table 4. The study authors[21] reported that the difference of 13% in disease remission in favour of the stepped care group was below the 25% difference rate that was initially estimated to make the intervention worthwhile for being

implemented in clinical practice. Between-group (stepped care versus the comparison) differences in change from baseline for pain intensity, functional impairment, and depression were 3.3 (95% CI, −3.6 to 10.2), 6.0 (95% CI, 1.0 to 11.0), and −0.5 (95% CI, −3.7 to 2.6), respectively.

The study authors[21] identified several limitations of the RCT. There was a higher dropout rate in the comparison group (19%) than the stepped care group (6%), which the authors suggested may have influenced the results. Treatment adherence, compliance, and fidelity were not assessed, and the authors were unable to determine if stepped care was not successful due to treatment nonadherence, noncompliance with study procedures, intervention not delivered as it was supposed to be delivered, or lack of effect.[21]

Table 4: Summary of Findings of an RCT Evaluating the Stepped Care Model for People With Excess Body Weight and Knee Osteoarthritis[21]

Outcome	Findings	
	Stepped care intervention n = 87	Comparison group n = 84
Disease remission, n (%)	32 (39)	18 (26)
Between-group difference, % (95% CI)	12.6 (−2.3 to 27.4)	
P value[a]	0.10	
Pain intensity (VAS score)		
Baseline, mean (SD)	61.0 (14.5)	64.1 (16.4)
32 weeks, mean (SD)	40.0 (26.1)	46.0 (23.6)
Between-group difference in change from baseline, mean (95% CI)	3.3 (−3.6 to 10.2)	
P value[b]	0.35	
Functional impairment (WOMAC score)		
Baseline, mean (SD)	50.8 (13.3)	50.5 (12.3)
32 weeks, mean (SD)	30.4 (20.6)	35.5 (18.9)
Between-group difference in change from baseline, mean (95% CI)	6.0 (1.0 to 11.0)	
P value[b]	0.02	
Depression (DASS-21 score)		
Baseline, mean (SD)	6.3 (6.8)	6.1 (6.2)
32 weeks, mean (SD)	5.7 (6.4)	5.9 (7.2)
Between-group difference in change from baseline, mean (95% CI)	−0.5 (−3.7 to 2.6)	
P value[b]	0.74	

Outcome	Findings	
	Stepped care intervention n = 87	Comparison group n = 84
Adverse events, n	10 patients reported 13 adverse events: • 7 pain exacerbation related to strengthening exercises • 2 food intolerances related to diet program • 4 mild gastrointestinal reactions related to diet program	NR
Serious adverse events, n	0	NR

CI = confidence interval; DASS-21 = Depression, Anxiety, and Stress Scale – 21 items; NA = not applicable; NR = not reported; PASS = Patient Acceptable Symptom State; RCT = randomized controlled trial; SD = standard deviation; VAS = visual analogue scale; WOMAC = Western Ontario and McMaster Osteoarthritis Index.

[a]Tested via the 2-proportion Z-test.

[b]Tested via independent t-test or Wilcoxon rank-sum test, as appropriate.

Additional analyses pre- and post- intervention were conducted in treatment subgroups at Step 2.[21] The authors acknowledged that the sample size in each sub-treatment group was small and not powered to identify differences in outcomes between subgroups. The authors suggested that the lack of guidance provided to the participants allocated to the maintenance subgroup might have led to the worsening of symptoms observed during step 2 of the stepped care intervention.

The authors also claimed that they overestimated the disease remission rate in both stepped care and comparison groups, which impacted their sample size calculation. Finally, the trial authors stated that they did not conduct a cost-effectiveness analysis that would have assisted them in the decision to potentially implement the stepped care approach.[21]

Stepped Care Model for Pain Management (SCM-PM)

Two studies (1 uncontrolled before-after study[25] and 1 retrospective cohort study[24]) reported on the Veterans Health Administration Stepped Care Model of Pain Management (SCM-PM), established in 2009 to bolster non-opioid, multimodal care for US veterans with chronic pain.[24,25] The 3 steps in the model are based on levels of care: primary care, consultations with specialty care, and tertiary interdisciplinary care. The goal of the stepped care model was to change primary care providers' behaviours and improve the process of care for people with chronic pain.[24,25] Further details of the model are presented in Table 5.

The characteristics of both studies are presented in Table 6. The uncontrolled before-after study of 12 primary centres compared electronic health record data at 1 year before the implementation of SCM-PM for chronic pain with data at 1 year following the 3-year intervention.[25] Participants included 25 primary care providers and their adult patients with chronic pain of any etiology. The patients were identified by a validated algorithm using available electronic health record data elements (e.g., diagnostic codes, pain scores, and prescribed medication). The retrospective cohort study[24] compared a pain cohort treated according to SCM-PM with a non-pain cohort treated in the integrated veteran's health system over the same 5-year period.

The findings of the uncontrolled before-after study[25] are presented in Table 7. The authors reported that implementation of SCM-PM was associated with improvements in provider's pain care documentation, pain treatment and pain follow-up. Referrals from primary care providers to behavioural health providers and chiropractic professionals increased and referrals to neurologic and orthopedic surgery decreased following implementation of SCM-PM. The study authors reported no decline in opioid prescribing. However, among patients

Table 5: Characteristics of SCM-PM[24,25]

Characteristic	Description
Model, country	Stepped Care Model of Pain Management, US
Model components	
Step 1	Primary care: • Primary care provider identifies and discusses patient's pain concerns and develops a treatment plan based on self-management and primary care interventions • Routine screening for presence and intensity of pain • Comprehensive pain assessment and follow-up • Documentation of function status and goals • Management of common pain conditions • Systematic opioid risk assessment, refill, monitoring • Use of PACTs, comprised of primary care providers, nurses and other providers in a primary care setting
Step 2	Secondary consultation: • Additional resources and more active-collaborative treatment such as behavioural health assessment, medication, consultation with specialists • Integrated behavioural health • Mindfulness, stress reduction • Rehabilitation medicine, physical therapy referral • Substance abuse programs, buprenorphine • Chiropractic • Virtual pain specialty referral (e-consults and project ECHO)
Step 3	Tertiary interdisciplinary care: • Increased care and involvement from pain management team • Referrals to community partners
Implementation details	• Pre-implementation qualitative and quantitative assessments • Emphasis was placed on the use of onsite and telehealth resources to account for the limited access to outside specialty care • Promoting Action on Research Implementation in Health Services framework guided implementation • Implementation activities included: provider continuing medical education (including pain care, pain management, opioid prescribing), new protocols for pain assessment and management, EHR templates, chronic pain and opioid prescribing policy, opioid management dashboard, telehealth consultations, enhanced onsite specialty resources

ECHO = Extension for Community Health Outcomes; EHR = electronic health record; PACT = patient-aligned care team; SCM-PM = Stepped Care Model for Pain Management.

Table 6: Characteristics of Studies Evaluating SCM-PM[24,25]

Characteristic	Description	
Study design	Uncontrolled before-after study[25]	Retrospective cohort study[24]
Setting	Community Health Care Centre, Inc, comprising 12 primary health centres at a multi-site community health centre in Connecticut, US	VA Connecticut Health Care System, comprising a tertiary hub with inpatient and outpatient facilities, another large outpatient facility, and 6 community-based outpatient clinics
Study period	March 2010 to February 2015	July 2008 to June 2013
Funding sources	• The Mayday Fund • The Wallace Foundation	• Program for Research Leadership Award from the Patrick and Catherine Weldon Donaghue Medical Research Foundation: • The Mayday Fund • The Veterans Health Administration Health Services Research and Development Service Center of Innovation
Inclusion criteria	All primary care providers who were present during 3-year implementation of SCM-PM Adult patients with chronic pain under the care of the providers with ≥ 1 medical visit in previous year	Veteran patients receiving primary care through an integrated VA health system who had ≥ 1 visit with a documented pain intensity rating of moderate to severe over 5-year period (intervention group) Veteran patients seen in primary care with no indication of pain and veterans reporting only mild pain intensity (comparison group)
Intervention	SCM-PM	SCM-PM (pain cohort)
Comparison	NA	Non-pain cohort
Sample characteristics	**N = 25 primary care providers** Female: 56% Medical doctor: 68% Advanced practice nurse practitioner: 32% Primary care providers' patients: **N = 3,357 patients at pre-intervention** Age: 27% were aged 18 to 39 years; 57% were aged 40 to 59 years; and 16% were aged 60 years or older Female: 63% Medicaid insurance: 66% Medicare insurance 19% Private insurance 7% Uninsured 7%	Intervention (pain cohort), N = 31,286 Mean age: 62.6 years Female: 6.8% Mean maximum pain score: 6.5, on a scale of 0 (no pain) to 10 (worst pain imaginable) Comparison (non-pain cohort), N = NR Mean age: 68.9 years Female: 3.3% Mean maximum pain score: 0.3, on a scale of 0 (no pain) to 10 (worst pain imaginable)

Characteristic	Description	
(continued)	**N = 4,385 patients at post-intervention** Age: 25% were aged 18 to 39 years; 56% were aged 40 to 59 years; and 18% were aged 60 years or older Female: 64% Medicaid insurance: 64% Medicare insurance 19% Private insurance 10% Uninsured 7%	
Relevant outcomes	• Quality of pain care documentation (Pain Care Quality extraction tool) for 300 randomly selected charts • Documentation of pain scores • Opioid prescribing • Health care use (health care visits, behavioural health, pain referrals, opioid treatment agreements, urine drug screens)	• Pharmacotherapy use (pharmacy data) • Health care use (referrals, health care visits)
Follow-up	5 years (1 year before 3-year implementation and 1 year after implementation)	5 years

NA = not applicable; SCM-PM = Stepped Care Model for Pain Management; VA = Veterans Affairs.

receiving chronic opioid therapy, the use of opioid treatment agreements and urine drug screens increased by 27.3% and 22.6%, respectively.[25]

The findings of the retrospective cohort study[24] are presented in Table 8. The study authors reported that, within the pain cohort, long-term opioid treatment decreased over 5 years, while non-opioid prescriptions increased. The authors also reported that SCM-PM was associated with increased referrals by primary care providers for any consultations. Overall, the number of referrals to specialty services increased for the pain cohort, but little change was observed for those not in the pain cohort. The authors reported that the largest increases in the pain cohort were in referrals to physiotherapy and occupational therapy. Similarly, patient visits for any reason increased in the pain cohort, with the largest increases being in visits for mental health, clinical health psychology and physiotherapy. The study authors also reported that the proportion of veterans in the pain cohort receiving at least 1 non-opioid pain medication and at least 1 referral to a specialty care service increased from 24.5% in year 1 to 29% in year 5, which the authors considered receipt of multimodal pain care.[24]

Limitations were reported by the authors of both studies.[24,25] In the uncontrolled before-after study,[25] the authors acknowledged that the evaluation focused on process measures and did not include measures of patient outcomes other than pain scores. The interventions used in the study, such as templates and dashboards, were implemented agency-wide and could not be limited to selected practices. As such, randomization was not possible, limiting the ability to eliminate unmeasured confounders. Provider turnover, which ranged from 11% to 20% over the study period, also limited the number of health care providers included in the analysis.[25]

In the retrospective cohort study,[24] the authors defined the pain cohort as veterans reporting moderate to severe pain during at least 1 outpatient primary care encounter. Neither did this

definition distinguish presentations of acute versus chronic pain or include veterans with mild pain intensity, nor was information on pain-related diagnoses available. Also, some of the

Table 7: Summary of Findings of an Uncontrolled Before-after Study Evaluating SCM-PM[25]

Outcome	Findings		
	Pre-intervention	Post-intervention	P value[a]
Pain care documentation (Pain Care Quality extraction tool), n (%)	N = 108	N = 213	—
Documentation of pain	69 (64)	174 (81)	< 0.001
Source or cause of pain	67 (62)	158 (74)	0.025
Functional assessment	5 (5)	42 (19)	< 0.001
Review of diagnostic tests	6 (6)	37 (17)	< 0.003
Treatment plan	99 (92)	209 (98)	0.006
Pain medication ordered	102 (94)	182 (85)	0.017
Pain consult ordered	7 (7)	60 (28)	< 0.001
Patient education	16 (15)	47 (22)	0.121
Diagnostic imaging ordered	25 (23)	59 (28)	0.379
Assessment of treatment effectiveness	18 (17)	83 (39)	< 0.001
Documented pain score, n (%)	N = 3,330	N = 4,385	—
Pain score > 8 (scale NR), n (%)	2,504 (75.2)	3,245 (74.0)	0.351
Opioid prescribing, n (%)			
Any opioid prescribed	1,615 (48.5)	1,943 (44.3)	0.117
Chronic opioid therapy (≥ 90 days in 1 year)	763 (22.9)	921 (21.0)	0.486
Health care visits			
Mean number of visits (SD)	7.3 (14.37)	6.83 (14.37)	0.094
Patients with behavioural health visit, n (%)	809 (24.3)	1,276 (29.1)	0.009
Pain referrals, n (%)			
Chiropractic	3 (0.1)	48 (1.1)	0.008
Physical therapy	480 (14.4)	750 (17.1)	0.508
Neurologic or orthopedic surgery	663 (19.9)	693 (15.8)	< 0.001
Rheumatology	120 (3.6)	136 (3.1)	0.419
Health care use (for patients receiving chronic opioid therapy), n (%)	N = 1,309	N = 1,230	—
Opioid treatment agreement	360 (34)	778 (61)	< 0.05
Urine drug screen	680 (64)	1,103 (87)	< 0.05

NR = not reported; SD = standard deviation.

[a]Tested via multiple-group models that account for the clustering within provider.

Table 8: Summary of Findings of a Retrospective Cohort Study Evaluating SCM-PM[24]

Outcome	Findings		
	Year 1[a]	Year 5[b]	P value[c]
Pharmacotherapy use, %			
Long-term opioid therapy (> 90 days)	—	—	< 0.0001[d]
Pain cohort	4.2	3.3	—
Any non-opioid medication	—	—	< 0.0001
Pain cohort	36.7	39.8	—
Non-pain cohort	23.3	22.6	—
Sedative or hypnotic	—	—	< 0.0001
Pain cohort	17.4	17.2	—
Non-pain cohort	12.4	11.3	—
Topical analgesics	—	—	0.0058
Pain cohort	3.5	4.8	—
Non-pain cohort	0.7	0.7	—
NSAIDs	—	—	< 0.0001
Pain cohort	15.7	19.3	—
Non-pain cohort	7.3	7.3	—
Antidepressant	—	—	< 0.0001
Pain cohort	5.7	5.9	—
Non-pain cohort	3.5	3.1	—
Anticonvulsant	—	—	< 0.0001
Pain cohort	10.9	12.8	—
Non-pain cohort	6.4	6.7	—
Referrals, %			
Any referral	—	—	< 0.0001
Pain cohort	43.4	51.8	—
Non-pain cohort	27.5	28.6	—
Mental health	—	—	0.56
Pain cohort	6.0	5.0	—
Non-pain cohort	3.1	2.6	—
Physical therapy	—	—	< 0.0001
Pain cohort	14.8	27.4	—
Non-pain cohort	4.0	5.6	—
Occupational therapy	—	—	< 0.0001

Outcome	Findings		
	Year 1[a]	Year 5[b]	P value[c]
Pain cohort	5.2	11.0	—
Non-pain cohort	1.9	2.2	—
Chiropractic	—	—	< 0.0001
Pain cohort	1.4	3.2	—
Non-pain cohort	0.3	0.5	—
Neurology	—	—	0.002
Pain cohort	10.3	10.7	—
Non-pain cohort	3.4	3.0	—
Pain medicine	—	—	< 0.0001
Pain cohort	3.2	3.8	—
Non-pain cohort	0.2	0.4	—
Health care visits (≥ 1 visit by patient), %			
Any health care visit	—	—	< 0.0001
Pain cohort	27.9	37.3	—
Non-pain cohort	11.4	12.6%	—
Mental health	—	—	< 0.0001
Pain cohort	28.0	30.5	—
Non-pain cohort	20.0	19.3	—
Clinical health psychology	—	—	< 0.0001
Pain cohort	4.7	7.2	—
Non-pain cohort	2.0	2.5	—
Physical therapy	—	—	< 0.0001
Pain cohort	16.2	22.9	—
Non-pain cohort	4.1	4.8	—
Occupational therapy	—	—	< 0.0001
Pain cohort	5.6	10.0	—
Non-pain cohort	2.0	2.3	—
Chiropractic	—	—	0.0019
Pain cohort	1.4	3.8	—
Non-pain cohort	0.3	0.8	—
Neurology	—	—	< 0.0001
Pain cohort	10.0	13.3	—
Non-pain cohort	6.0	6.4	—
Pain medicine	—	—	< 0.0001

Outcome	Findings		
	Year 1[a]	Year 5[b]	P value[c]
Pain cohort	2.9	3.2	—
Non-pain cohort	0.5	0.3	—
Multimodal care	—	—	< 0.0001
Pain cohort	24.5	29.0	—
Non-pain cohort	12.8	12.6	—

NSAID = nonsteroidal anti-inflammatory drug.

[a]Sample sizes for year 1: Pain cohort, n = 11,601; non-pain cohort, n = 32,347.

[b]Sample sized for year 5: Pain cohort, n = 15,099; non-pain cohort, n = 29,375.

[c]Interaction test via general estimating equations logit-linked, logistic regression models with robust variance estimation and intercept, controlling for patients nested within providers, and patient age and sex.

[d]Change over time in the pain cohort only.

specialty pain care services included in the analyses provided services that extend beyond pain. Because the authors did not examine diagnoses associated with care in these settings, they were unable to conclude whether pain-specific care was delivered. Sedatives and/or hypnotics, antidepressants, and anticonvulsants are also commonly used for management of disorders other than pain. The data did not specify the diagnosis for the prescription. Furthermore, although the authors used a broad definition of 1 non-opioid pharmacological treatment and 1 nonpharmacological pain management service to represent multimodal pain care and guideline concordant care, details regarding veterans' presenting problems and the services they received were not available and it was not possible to determine whether veterans were receiving appropriate services. Finally, because several changes were implemented at national, regional, and local levels, and changes were implemented throughout Veterans Health Administration Connecticut Health Care System, it was not possible to isolate what caused any specific change; rather, the authors were only able to examine temporal trends.[24]

Stepped Care Model for Non-Cardiac Chest Pain (NCCP)

One uncontrolled before-after study evaluated a pilot multidisciplinary biopsychosocial model with a stepped care approach that was set up in a cardiology outpatient clinic in London, UK for people with non-cardiac chest pain (NCCP).[26] The model consisted of 3 steps: comprehensive physician and psychological assessment, low intensity CBT in the form of guided self-help delivered by a trained cardiac nurse or clinical psychologist, and high intensity CBT with a clinical psychologist. Details of the model are presented in Table 9.

The uncontrolled before-after study[26] included 77 adult patients with NCCP occurring more than once per month. Patients were evaluated for chest pain and chest pain interference, beliefs about chest pain,[26] depression, anxiety, quality of life, and health care use at baseline, then at 3- and 6-months after the initiation of treatment (post-treatment and follow-up beyond the end of treatment, respectively). The characteristics of the study are presented in Table 10.

The findings of the uncontrolled before-after study are presented in Table 11. The authors reported that the stepped care approach had large effects on chest pain post-intervention (3 months) and at 6 months compared to baseline (before the intervention), as indicated by reduced frequency of pain, improved chest pain interference and severity scores, and improved negative beliefs and/or convictions that chest pain is attributable to a cardiac

Table 9: Characteristics of Stepped Care Model for NCCP[26]

Characteristic	Description
Model, country	Stepped care approach for NCCP, UK
Model components	
Step 1	Biopsychosocial assessment: in-depth assessment of chest pain by cardiologist and psychological factors by psychologist; medical therapy offered when appropriate (medical or referral to another medical services)
Step 2	Low intensity CBT: guided self-help, supported by a standardized booklet and audio CD, delivered in 30-minute sessions (up to 6 sessions available), 4 modules (mindful abdominal breathing, progressive muscle relaxation, increasing activity, cognitive therapy)
Step 3	High intensity CBT: additional information and support, delivered in 50-minute sessions (up to 8 sessions available), tailored treatment and additional aspects (such as psychoeducation about stress and specific psychosocial disorders, exploring beliefs, problem-solving and cognitive work, and behavioural activation for depression)
Implementation details	Can be delivered by a cardiac nurse, clinical psychologist (trained in providing and supervising CBT), and a cardiologist, and integrated into any chest pain clinic

CBT = cognitive behavioural therapy; CD = compact disc; NCCP = non-cardiac chest pain.

Table 10: Characteristics of Prospective Study Evaluating Stepped Care Model for NCCP[26]

Characteristic	Description
Study design	Uncontrolled before-after study
Setting	1 chest pain clinic at a teaching hospital, London, UK
Enrollment period	December 2011 to December 2012
Funding source	Guy's and St Thomas' Charity
Inclusion criteria	Adult patients with NCCP more than once per month for at least 3 months
Sample characteristics	N = 77 patients at pre-intervention; 68 at post-intervention Mean age (SD): 50 (10.9) years, range 25 to 73 years Female: 54% Chest pain present > 6 months: 79%
Relevant outcomes	• Pain frequency • Pain severity (scale of 1 [not at all] to 10 [extremely]) • Pain interference (scale of 1 [not at all] to 10 [extremely]) • Negative beliefs about chest pain (scale of 1 [do not believe] to 10 [definitely believe]) • Depression (PHQ9; higher score = more depressive symptoms) • Anxiety (GAD7; higher score = more anxiety symptoms) • Quality of life (WSAS; higher score = more impairment) • Health care resource use (CSRI; not further described in study)
Follow-up	6 months

CSRI = Client Service Receipt Inventory; GAD7 = Generalized Anxiety Disorder 7-item Scale; NCCP = non-cardiac chest pain; PHQ9 = Patient Health Questionnaire 9; SD = standard deviation; WSAS = Work and Social Adjustment Scale.

cause. Depression and anxiety scores decreased at post-intervention and at 6 months compared to baseline, as did impact on daily life scores (i.e., less impairment). In addition, there was less use of numerous health care resources (e.g., general practitioner, emergency department, cardiologist, appointments, consultations) at 6 months following participation in the stepped care model.[26]

The study authors[26] stated their limitations. There was no comparison group. The length of the intervention was not standardized, as treatment was tailored to each patient's needs. Some participants, particularly those in the high intensity CBT group, continued to receive treatment after 3 months. Longer-term follow-up (e.g., 12 months) was not offered, which limited any claims about sustained improvement. There was no formal economic analysis, so the impact of the stepped care model on health care costs is uncertain.[26]

Table 11: Summary of Findings of an Uncontrolled Before-after Study Evaluating the Stepped Care Model for NCCP[26]

Outcome	Findings			
	Pre-intervention, n = 77	Post-intervention (3 months), n = 75	Follow-up (6 months), n = 68	P value[a]
Pain frequency, %	—	—	—	< 0.001
Daily or more often	44	13	7	—
Weekly	39	28	19	—
Monthly	17	20	25	—
Less than monthly	0	39	49	—
Presence of pain, %				
Do you have chest pain that bothers you? (Yes)	100	73	65	< 0.001
Scores on scale, mean (SD)				
Severity of chest pain	5.8 (2.5)	4.0 (2.7)	3.4 (2.4)	< 0.001
Interference of chest pain	5.9 (2.2)	3.2 (2.6)	2.6 (2.1)	< 0.001
Negative beliefs				
Chest pain is a heart attack	5.6 (3.3)	2.0 (2.1)	1.9 (2.0)	< 0.001
Chest pain indicates a serious condition	5.4 (3.2)	2.2 (2.2)	2.1 (2.2)	< 0.05
Depression (PHQ9 score)	8.8 (7.2)	5.4 5.8)	4.4 (5.0)	< 0.05
Anxiety (GAD7 score)	6.9 (6.0)	4.6 (5.)	3.6 (4.7)	< 0.05
Quality of life (WSAS score)	10.4 (10.4)	3.9 (7.5)	2.5 (5.7)	< 0.001
Health care use (CSRI), n (%)				
GP ≥ 3 visits	47 (63)	NR	30(47)	< 0.05
ED ≥ 1 visit	21 (28)	NR	5 (8)	< 0.05

Outcome	Findings			
	Pre-intervention, n = 77	Post-intervention (3 months), n = 75	Follow-up (6 months), n = 68	P value[a]
Cardiologist ≥ 1 visit	57 (63)	NR	2 (3)	< 0.05
Other physician ≥ 1 visit	25 (33)	NR	19 (30)	< 0.05
Health care appointments, mean (SD)	2.5 (1.1)	NR	0.8 (1.2)	< 0.05
Consultations for chest pain, mean (SD)	2.6 (3.1)	NR	0.1 (0.5)	< 0.05

ED = emergency department; CSRI = Client Service Receipt Inventory; GAD7 = Generalized Anxiety Disorder 7-item Scale; GP = general practitioner; PHQ9 = Patient Health Questionnaire 9; SD = standard deviation; WSAS = Work and Social Adjustment Scale.

[a]Tested via the Wilcoxon test for chest pain frequency and via paired t-tests for chest pain interference. For other outcomes, t-tests were used for normally-distributed data and Wilcoxon tests were used for proportions.

Stepped Care Strategy for Chronic Hip or Knee Pain (Beating osteoARThritis)

One prospective cohort study evaluated a multidisciplinary stepped care strategy (SCS), named Beating osteoARThritis, that was developed to improve the non-surgical care of people with chronic pain due to hip or knee osteoarthritis.[23] The model and its implementation in general practices in Nijmegen, the Netherlands was also described in another separate publication.[29] SCS aimed to support primary care providers and patients to achieve high-quality care by presenting the ideal sequence for care in a 3-step model. The first step includes modalities (e.g., education, lifestyle advice, and paracetamol), which should be offered to all patients or can be provided through self-care. The second and third steps include more advanced modalities (e.g., physical therapy, dietary therapy, and intra-articular injections) that can be provided if the previous options had not succeeded.[23,29] Details of SCS are presented in Table 12.

Table 12: Characteristics of SCS[23,29]

Characteristic	Description
Model, country	SCS, the Netherlands
Model components	
Step 1	• Medical history and physical examination • Assessment function and activity limitations • Setting mutual goals • Education (regarding the disease, treatment modalities, and prognosis) • Lifestyle advice (regarding exercise, weight reduction, and prevention of overload) • Medication: acetaminophen, glucosamine sulphate • Evaluation: 3 months (or earlier if symptoms persist or increase)

Characteristic	Description
Step 2	• Radiological assessment (if discrepancy between medical history and physical examination) • Assessment of pain coping and psychosocial factors • Adjust goals • Exercise therapy • Dietary therapy (i.e., counselling by a dietician) if overweight • Medication: (topical) NSAIDs, Tramadol • Evaluation: 3 to 6 months (or earlier if symptoms persist or increase)
Step 3	• Consultation specialist • Adjust goals • Multidisciplinary care • Transcutaneous electrical nerve stimulation • Intra-articular injections • Evaluation: patient-set intervals
Implementation details	A regional implementation advisory board, consisting of a patient representative and 9 experts representing the main disciplines involved in osteoarthritis care (2 GPs, 1 practice nurse, 1 physical therapist, 1 dietician, 1 rheumatologist, 1 orthopedic surgeon, 2 researchers) was set up to agree on implementation activities aligned to patients as well as different health care providers. The activities were based on previous implementation studies in related research fields and included: education and reminder material for patients; education outreach visits, education and reminder material, and multidisciplinary seminars for health care professionals.

GP = general practitioner; NSAID = nonsteroidal anti-inflammatory drug; SCS = stepped care strategy.

The prospective cohort study[23] compared a cohort of patients who received stepped care strategy-consistent (SCS-consistent) care for hip or knee pain due to osteoarthritis with a cohort who received SCS-inconsistent care over 2 years. Participants in the SCS-consistent group received the following: education and lifestyle advice during the study period, all advised step 1 modalities before any step-2 modality (if applicable), and all advised step 1 and step 2 modalities before any step 3 modality (if applicable). Further characteristics of the study are presented in Table 13.

Table 13: Characteristics of a Prospective Cohort Study Evaluating SCS[23]

Characteristic	Description
Study design	Prospective cohort study
Setting	38 GP practices, Nijmegen, the Netherlands Rural practices: 61% Solo practices: 17%
Study period	August 2010 to March 2013
Funding sources	• The Dutch Arthritis Association • The Royal Dutch Society for Physical Therapy • The Sint Maartenskliniek • The Anna foundation

Characteristic	Description
Inclusion criteria	Adult patients who visited their GP for a new episode of hip or knee complaints due to symptomatic hip or knee osteoarthritis
Sample characteristics	N = 70 GPs Intervention (SCS-consistent care), N = 117 patients Mean age (SD) = 62 (10) years Female = 63% Pain location: hip = 54%, knee = 74% Duration of symptoms > 1 year: 76% Overweight (BMI > 25kg/m^2): 65% Health insurance, with additional coverage: 95% Comparison (SCS-inconsistent care), N = 163 patients Mean age (SD): 65 (10) years Female: 62% Pain location: hip = 49%, knee = 80% Duration of symptoms > 1 year: 80% Overweight: 73% Health insurance, with additional coverage: 88%
Relevant outcomes	• Pain (WOMAC; scale of 0 to 100 where higher scores reflect better health status) • Physical function (WOMAC) • Self-efficacy (Dutch General Self-Efficacy Scale; scale of 10 to 40, where higher scores reflect higher self-efficacy) • Active pain coping assessed (Pain Coping Inventory; scale of 12 to 48, where higher scores indicate greater use of an active coping style) • Health care use
Follow-up	2 years

BMI = body mass index; GP = general practitioner; NSAID = nonsteroidal anti-inflammatory drug; SCS = stepped care strategy; SD = standard deviation; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

The authors of the prospective cohort reported[23] that pain and physical function improved after receiving SCS-consistent care; whereas, the levels of self-efficacy and active pain coping did not differ after 2 years. The summary of findings for the SCS-consistent care group of the study is presented in Table 14.

The authors[23] also reported that there were no differences between SCS-consistent and SCS-inconsistent care cohorts on scores for pain physical function, self-efficacy, or active pain coping, after adjusting for potential confounders. Seventeen percent of the patients in the SCS-consistent group and 18% in the SCS-inconsistent group received a surgical procedure within 2 years (P = 0.82). The summary of between-group findings is presented in Table 15.

Table 14: Summary of Findings of Cohort Study Evaluating SCS: Within Group Changes From Baseline in Intervention Group[23]

Outcome	Findings, n = 117			
	Baseline, mean (SD)	24 months, mean (SD)	Change from baseline, mean (95% CI)	P value[a]
Pain (WOMAC score)	62 (22)	70 (23)	7.0 (4.2 to 9.8)	0.00
Physical function (WOMAC score)	64 (21)	70 (23)	5.6 (3.2 to 8.0)	0.00
Self-efficacy (Dutch Self-Efficacy Scale)	31 (5)	31 (5)	0.0 (−0.6 to 0.6)	0.99
Active pain coping (Pain Coping Inventory)	54 (12)	52 (13)	−1.2 (−2.6 to 0.3)	0.12

CI = confidence interval; SCS = Stepped Care Strategy; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

[a]Tested via paired t-tests.

Table 15: Summary of Findings of Cohort Study Evaluating SCS: Between-Group Differences[23,29]

Outcome	Findings at 24 months			
	SCS-consistent, Beta coefficient (95% CI) n = 117	SCS-inconsistent, Beta coefficient (95% CI) n = 163	Adjusted difference between groups (95% CI) [a]	P value[a]
Pain (WOMAC score)	3.6 (−0.6, 7.7)	8.8 (4.9, 12.7)	−4.3 (−10.3 to 1.7)	0.16
Physical function (WOMAC score)	4.3 (0.42, 8.1)	7.4 (4.0, 10.8)	−1.9 (−7.0, 3.1)	0.45
Self-efficacy (Dutch Self-Efficacy Scale)	0.6 (−0.3, 1.5)	−0.4 (−1.2, 0.4)	0.6 (−8.3, 2.0)	0.41
Active pain coping (Pain Coping Inventory)	−0.6 (−2.8, 1.6)	−1.6 (−3.6, 0.4)	1.7 (−1.5, 4.9)	0.30

CI = confidence interval; EHR = electronic health records; NA = not applicable; SCS = Stepped Care Strategy; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

[a]Tested via generalized estimating equations analysis. The analyses were adjusted for age, number of comorbidities, additional insurance coverage, number of painful joints, general practitioner's sex, and general practitioner's attitude regarding the effectiveness of non-recommended non-surgical treatment modalities.

The authors[23] noted several limitations of the prospective cohort study. Participants who received SCS-consistent care were younger, had fewer comorbidities and painful joints, and were more likely to have additional health care insurance; therefore SCS-inconsistent care may sometimes have been unavoidable or even preferable. The time frame of the study may have been too short to detect differences in pain, physical function, self-efficacy, and active pain coping. Lastly, the authors noted that an observational study, in contrast to an RCT, may not be the ideal design to evaluate SCS. Although baseline differences were adjusted in the analyses, unknown and not measured differences could not be adjusted for.[23]

Evaluation of Stepped Care for Chronic Pain (ESCAPE)

The Evaluation of Stepped Care for Chronic Pain (ESCAPE) RCT[22] evaluated the effectiveness of a stepped care model involving 12 weeks of analgesic therapy optimization according to an algorithm coupled with pain self-management strategies (step 1) followed by 12 weeks of CBT (step 2) compared with usual care. US veterans of the Afghanistan and Iraq conflicts with chronic and disabling musculoskeletal pain were block randomized to the stepped care intervention or usual care. All baseline and follow-up assessments were conducted by a researcher who was blinded to the treatment allocation. Characteristics of the stepped care model and RCT are presented in Table 16 and Table 17.

Table 16: Characteristics of Model in ESCAPE[22]

Characteristic	Description
Model, country	Evaluation of Stepped Care for Chronic Pain, US
Model components	
Step 1	12 weeks, with the aim of reducing pain intensity, encouraging activity, and providing education • Analgesic treatment optimization according to an evidence-based algorithm began with first-line, simple analgesics such as acetaminophen and NSAIDs, followed by topical analgesics, gabapentinoids, tricyclic antidepressants and cyclobenzaprine hydrochloride, tramadol, short-acting opioids, and lastly long-acting opioid analgesics. • Pain self-management strategies: education about natural history of chronic pain, common treatments for chronic pain, importance of behavioural activation, including stretching and strengthening exercises, and resumption of normal activities as soon as possible; relaxation techniques, goal setting, problem-solving, behavioural plans, and strategies to improve communication with health care providers.
Step 2	12 weeks • CBT intervention: 6 biweekly sessions lasting approximately 45 minutes delivered over the telephone by a nurse manager • Objectives: identify difficulties, identify negative thoughts, reframe thoughts, enhance coping
Implementation details	• Delivered by 2 nurse managers trained in all treatment components (optimization of analgesic treatment, self-management strategies, CBT) who met weekly with physician investigators and a supervising psychologist to review care of the intervention group, a model of case supervision implemented in previous trials • Biweekly telephone contacts between the patients and nurse managers for a total of 12 contacts during the trial period • Procedures implemented to ensure treatment fidelity included: extensive training, observation, audiotaping, and feedback after treatment sessions. To enhance reproducibility of stepped care model, a manualized and algorithmic approach in the context of a care management delivery model was used.

CBT = cognitive behavioural therapy; ESCAPE = Evaluation of Stepped Care for Chronic Pain; NSAID = nonsteroidal anti-inflammatory drug;; VA = Veterans Affairs.

Table 17: Characteristics of ESCAPE RCT[22]

Characteristic	Description
Study design	RCT
Setting	1 post-deployment clinic and 5 general medicine clinics at 1 VA medical centre, Indiana, US
Enrollment period	Enrollment December 2007 to June 2011
Funding source	Merit Review grant from the VA Rehabilitation Research and Development
Inclusion criteria	OEF/OIF/OND veteran patients with self-reported chronic pain (> 3 months' duration) of the cervical or lumbar spine or an extremity (hip, knee, or shoulder), and if pain was at least moderately disabling (RMDQ score of ≥ 7) at the initial visit

Characteristic	Description
Sample characteristics	Intervention, N = 121 patients Mean age (SD): 36.4 (10.1) years Female: 9.9% Pain location: back = 52.9%, knee = 23.1%, neck = 8.3%, shoulder = 8.3%, hip = 7.4% Comparison (usual care), N = 120 Mean age (SD): 38.2 (10.5) years Female: 13.3% Pain location: back = 61.7%, knee = 20.0%, neck = 6.7%, shoulder = 5.8%, hip = 5.8%
Relevant outcomes	• Pain interference (BPI; scale of 0 to 10 where higher scores = greater pain interference) • Pain severity (GCPS; scale of 0 to 100 where higher scores = greater pain severity) • Pain-related disability (RMDQ; scale of 0 to 24 where higher scores = greater disability) • Pharmacotherapy use
Follow-up	9 months

BPI = Brief Pain Inventory; CBT = cognitive behavioural therapy; ESCAPE = Evaluation of Stepped Care for Chronic Pain; GCPS = Graded Chronic Pain Scale; OEF = Operation Enduring Freedom; OIF = Operation Iraqi Freedom OND = Operation New Dawn; RCT = randomized controlled trial; RMDQ = Roland Morris Disability Scale; SD = standard deviation; VA = Veterans Affairs.

The findings of the RCT are presented in Table 18. The authors[22] reported that the stepped care model led to improvements in the following pain outcomes compared to usual care: pain interference, pain severity, and pain-related disability. Patients in the stepped care group were more likely to demonstrate at least a 30% improvement in Roland Morris Disability Scale scores by 9 months (relative risk, 1.52 [95% CI, 1.22 to 1.99]; P < 0.001), with a number needed to treat of 7.5 for 30% improvement. Participants in the stepped care group received more analgesics at the end of step 1 (3 months) relative to what they were prescribed at baseline. However, at the study end (9 months), the authors reported that participants in stepped care were using more topical analgesics than those in the usual care group, and participants in the usual care group were receiving more tricyclic antidepressants than those in the stepped care group, but the authors stated they did not find a significant difference between groups in opioid use. The authors concluded that the stepped care model was effective in reducing pain-related outcomes in veterans with chronic musculoskeletal pain of the spine and extremities.[22]

Table 18: Summary of Findings of ESCAPE RCT[22]

Outcome	Stepped care, n = 121	Usual care, n = 120
Pain interference (BPI score)		
Baseline, mean (SD)	5.4 (2.1)	5.4 (2.4)
9 months, mean (SD)	3.8 (2.6)	4.5 (2.7)
Change from baseline, mean (95% CI)	−1.7 (−2.1 to −1.3)	−0.9 (−1.2 to −0.05)
Between-group difference, mean (95% CI)	−0.8 (−1.3 to −0.3)	
P value[a]	0.003	

Outcome	Stepped care, n = 121	Usual care, n = 120
Pain severity (GCPS score)		
Baseline, mean (SD)	67.3 (12.1)	65.1 (15.2)
9 months, mean (SD)	56.9 (19.1)	61.0 (19.3)
Change from baseline, mean (95% CI)	−11.1 (−13.9 to −8.3)	−4.5 (−7.3 to −1.8)
Between-group difference, mean (95% CI)	−6.6 (−10.5 to −2.7)	
P value[a]	0.001	
Pain-related disability (RMDS score)		
Baseline, mean (SD)	14.0 (4.3)	13.7 (4.7)
9 months, mean (SD)	10.6 (6.3)	12.1 (6.4)
Change from baseline, mean (95% CI)	−3.7 (−4.5 to −2.8)	−1.7 (−2.6 to −0.9)
Between-group difference, mean (95% CI)	−1.9 (−3.2 to −0.7)	
P value[a]	0.002	
Pharmacotherapy use (EHR review), %		
Opioids		
Baseline	34.7	44.2
9 months	30.6	35.8
P value	0.38	
Simple analgesics		
Baseline	57.9	60
9 months	45.5	47.5
P value	0.74	
Topical analgesics		
Baseline	1.7	1.7
9 months	16.5	0.08
P value	0.001	
Gabapentin		
Baseline	5.8	19.2
9 months	14.9	16.7
P value	0.70	
Muscle relaxants		
Baseline	17.4	15.8
9 months	19	17.5
P value	0.76	

Outcome	Stepped care, n = 121	Usual care, n = 120
Tricyclic antidepressants		
Baseline	0.08	4.2
9 months	0	4.2
P value	0.023	

BPI = Brief Pain Inventory; CI = confidence interval; EHR = electronic health record; GCPS = Graded Chronic Pain Scale; RMDQ = Roland Morris Disability Scale; RCT = randomized controlled trial; SD = standard deviation.

[a]Estimates based on mixed-effect model with repeated measurements. Effect sizes are 0.26 for the BPI Pain Interference subscale, 0.21 for GCPS severity, and 0.24 for the RMDS.

[b]P value for between-group differences.

The authors[22] identified key limitations of the ESCAPE trial. The participants were all recent US veterans with chronic musculoskeletal pain, and their results may not apply to veterans from other eras or to nonveterans. The RCT was conducted at a single medical centre. Single-centre RCTs have shown larger treatment effects than multicentre RCTs. The trial assessed a multimodal intervention and used a bundled approach to delivery. Finally, while the outcome assessors were blinded to the treatment allocation, the study participants were unblinded.[22]

Objective 2: Identify and Summarize Literature on the Potential Cost Implications of Stepped Care Models of Care for Chronic Pain

One economic evaluation[27] was identified that described the cost implications of the stepped care approach. The study examined the relative cost-effectiveness of 3 pathways of treatment for sciatica pain. The stepped care pathway included 3 steps of increasing levels of complexity (initial, intermediate, and invasive therapies). The 2 comparison pathways were initial treatments in primary care only and immediate referral for surgery following initial treatments. The patient population was based on a systematic review that included studies of adult patients with sciatica or lumbar nerve root pain diagnosed clinically or confirmed by imaging, with a requirement for leg pain to be worse than back pain (i.e., to distinguish sciatica from nonspecific low back pain).[27] To ensure consistency, the same population also formed the basis for the economic model. Further details of the cost-effectiveness study are presented in Table 19.

Table 19: Characteristics of Economic Evaluation[27]

Characteristic	Description
Country	UK
Intervention pathway	Stepped care approach Step 1: initial treatments — inactive control, usual care, education or advice, activity restriction, non-opioids, and opioids Step 2: intermediate treatments — manipulation, traction, passive and active physical therapy, alternative or non-traditional treatments (acupuncture), biologic drugs (provided in secondary care by multidisciplinary teams) Step 3 — invasive therapies epidural or nerve block, disk surgery

Characteristic	Description
Comparison pathways	Primary care only • Initial treatments: inactive control, usual care, education or advice, activity restriction, non-opioids, and opioids • Initial treatments followed by immediate referral for surgery to alleviate symptoms
Type of analysis	Cost-effectiveness analysis
Funding source	UK National Institute for Health Research Health Technology Assessment program
Perspective	UK National Health Service
Time horizon	12 months
Population characteristics	Adult patients with sciatica or lumbar nerve root pain diagnosed clinically or confirmed by imaging. A requirement was that leg pain was worse than back pain.
Approach	• Decision analytic model • Treatments were categorized and compared in pair-wise meta-analysis followed by mixed treatment comparison analysis • Mean cost, probability of success, and 12-month utility gains were calculated for all possible treatment strategies • Incremental cost per patient with symptoms successfully resolved for all treatment strategies that were not excluded on the grounds of strict or extended dominance (i.e., where the next regime was both more effective and less costly or whereby a regime had an incremental cost-effectiveness ratio that is higher than the next more effective regime, respectively) was calculated • Incremental cost per utility gained over a 12-month period was calculated • A series of sensitivity analyses were conducted where baseline estimates were adjusted to reflect best and worst-case scenarios, utility values were adjusted for symptoms and symptom remission, potential for reductions in effectiveness of intermediate therapies and/or surgery in the stepped approach, and utility achieved with symptom resolution only because of successive failures
Main outcomes (systematic review)	• Global effect (including absence of pain) • Reduction in pain intensity • Improved function (composite condition specific outcome measure as continuous data using weighted mean difference and standardized mean difference)
Clinical and cost data	• Clinical effect estimates derived from a SR of clinical effectiveness and cost-effectiveness • Costs of managing patients based on expert opinion and published UK cost sources (2008 to 2009 prices) • Drug costs were from British National Formulary list prices • Non-traditional or alternative therapies were based on published NHS reference costs
Main assumptions	• Patients presenting with sciatica would be managed through 1 of 3 pathways: primary care, stepped approach, or immediate referral to surgery • Base-case assumptions were that there was no reduction in utility for previous unsuccessful treatments and when individual therapies are combined in sequence, effectiveness will be as high as stand-alone treatments

NHS = National Health Service; SR = systematic review.

The results of the cost-effectiveness analysis[27] are presented in Table 20. The incremental cost per patient with symptoms successfully resolved and the incremental cost per utility

gained for a patient with sciatica pain managed through 1 of the 3 treatment pathways over a 12-month period were calculated. The study authors[27] reported that the systematic review showed that no therapies can deliver 100% success. Their economic model similarly demonstrated that none of the strategies were 100% successful; however, the most successful regime in the stepped approach pathway was non-opioids, followed by biologic drugs, epidural and/or nerve block, and disk surgery. In the primary care pathway, the most successful regime was non-opioids. The pathway of immediate surgery was not cost-effective. The authors stated that the sensitivity analyses using the highest cost estimates resulted in comparable results. In terms of positive net benefit, the authors claimed that the stepped care approach would be regarded as cost-effective if the ceiling ratio for an additional unit of utility gain over 12 months was less than £5,100 and if the ceiling ratio for each additional success was less than £2,500.[27]

Table 20: Summary of Findings of the Economic Evaluation[27]

Main findings	Authors' conclusion
• Base-case analysis: costs were inactive control (£0), usual care for 6 weeks (£73.74), education/advice (£81), activity restriction (£70), alternative/non-traditional therapies (£70), non-opioids for 6 weeks (£122.23), opioids for 2- to 4-week prescriptions (£130.26), biologic drugs for 12-week course (£1646.74), manipulation, traction, passive physiotherapy, active physiotherapy (all £349), epidural (£602.76) and disk surgery with average length of hospital stay of 1.9 days (£1433.66). • Results were expressed as incremental cost per patient with symptoms successfully resolved and incremental cost per utility gained over a 12-month period. One-way sensitivity analyses were used to address uncertainty. • The economic model demonstrated that none of the strategies resulted in 100% success (defined as overall improvement or resolution of symptoms). • The most successful strategy in the stepped care pathway was non-opioids, followed by biologic drugs, followed by epidural/nerve block and disk surgery, with a probability of success (overall symptom improvement or resolution) of 0.996 (i.e., 3 patients would be unsuccessful for every 1,000 treated). • The treatment pathway of initial treatment followed by immediate surgery was not cost-effective. • Compared to inactive control, the following ICERs were associated with the following stepped approaches: treatment with non-opioids and alternative/non-traditional treatments (£999); non-opioids, alternative/non-traditional treatments, and epidural (£1992); non-opioids, alternative/non-traditional treatments, epidural, and disk surgery (£5023); and non-opioids, biologic therapies, epidural, and disk surgery (£388,478). • In terms of net benefit, the stepped care approach would be regarded as cost-effective if the ceiling ratio for an additional unit of utility gain over 12 months was < £5100 and if the ceiling ratio for each additional success was < £2500. • Sensitivity analyses identified that use of the highest cost estimates resulted in similar findings. • Sensitivity analysis showed that removal of biologic drugs from the stepped approach made little difference to the cost-effectiveness results.	"The stepped approaches to managing sciatica based on an initial treatment with non-opioids represent the most cost-effective regimens relative to direct referral to disk surgery, with positive net benefits emerging if the acceptable ceiling ratio for an additional unit of success was <£2500 with base-case costs and < £6000 if higher costs were applied to the model. The strategy of referring patients who fail initial treatments directly to disk surgery is unlikely to be cost-effective, with highly improbable reductions in cost and/or rates of success being required to elevate these regimens to the efficiency frontier. However, these findings remain tentative, and more research is required to develop the evidence base to inform more structurally appropriate economic models to inform decision-making and to determine patient preferences regarding treatment durations and extent of invasive treatments that would be acceptable." (p. 1327)

The authors described a number of limitations associated with the cost-effectiveness analysis.[27] The time perspective was limited to a 12-month horizon, with no evidence available to inform the inclusion of relapse and recurrence within the model. The following were not considered in the analysis: issues relating to work and productivity, preferences of patients for symptom resolution and treatment duration, exploration from a personal social services perspective, and possible additional costs associated with disk surgery. The authors reported that the base-case assumption regarding ultimate failure having an additional 0 cost to the National Health Service was contentious, but lack of data and consensus limited the evaluation of alternatives. Because of the small number of relevant studies for some comparisons of treatment strategies, the authors warned that results should be interpreted with caution due to statistical heterogeneity (within pair-wise comparisons) and potential inconsistency (between pair-wise comparisons) with the network. The authors also claimed that inclusion of anti-inflammatory biologic drugs within their economic model could be seen as contentious. Finally, it was acknowledged that the nature of the economic model was simplistic and did not fully account for structural and parameter uncertainty and distributions.[27]

Limitations

The purpose of this CADTH custom report was to identify and describe the literature on the potential benefits and harms, and cost implications of stepped care models for chronic pain. This report was not a formal program evaluation, and no conclusions were formed. The literature was not critically appraised and the quality of the evidence from included publications is unknown.

The 5 stepped care models describing potential benefits[21-26] were implemented in Australia, the Netherlands, US, and UK, where health care systems differ from those in Canada. The economic evaluation describing the cost implications of stepped care was conducted in the UK.[27] Therefore, the applicability of their findings to the Canadian setting is unclear.

Conclusions

Six relevant studies describing the potential clinical benefits of 5 different stepped care models[21-26] and 1 economic evaluation describing the cost implications of stepped care were included in this review. An RCT assessed a stepped care model for patients who are overweight or obese with chronic pain due medial tibiofemoral osteoarthritis (compared to a control group given educational booklets) and described the impact on pain remission, pain intensity and function, and adverse events.[21] For the SCMP, a before-after study[25] and a retrospective cohort study of a pain group versus and non-pain group[24] described the effects of the stepped care model on pain, quality of chronic pain care, pharmacotherapy use, and health care utilization in US veterans.[24,25] A before-after study of a biopsychosocial stepped care model for NCCP described the potential benefits on chest pain, depression, anxiety, quality of life, and health care use.[26] A prospective cohort of SCS compared patients who received stepped care strategy-consistent care for hip or knee pain due to osteoarthritis with a cohort who received stepped care strategy-inconsistent care and described the results on pain physical function, self-efficacy, active pain coping and health care use.[23] The ESCAPE RCT described the effects on pain, disability, and pharmacotherapy use in US veterans.[22] All studies[21,22,24-26] described at least some positive results for the clinical outcomes of interest.

The authors of the economic evaluation[27] reported that a stepped care pathway based on initial treatment with non-opioids may be cost-effective compared to direct referral to surgery.

References

1. Skelly A, Chou R, Dettori J, et al. Noninvasive nonpharmacological treatment for chronic pain: a systematic review. Rockville (MD): Agency for Healthcare Research and Quality (US); 2018: https://www.ncbi.nlm.nih.gov/books/NBK556229/pdf/Bookshelf_NBK556229.pdf. Accessed 2022 Mar 21.
2. Canadian Pain Task Force. Chronic pain in Canada: laying a foundation for action. Ottawa (ON): Health Canada; 2019: https://physiotherapy.ca/sites/default/files/canadian_pain_task_force_june_2019_report_en.pdf. Accessed 2022 Mar 21.
3. Canadian Pain Task Force Report: May 2021. Ottawa: Health Canada; 2021: https://www.canada.ca/en/health-canada/corporate/about-health-canada/public-engagement/external-advisory-bodies/canadian-pain-task-force/report-2021.html. Accessed 2022 May 13.
4. Classification of chronic pain. Descriptions of chronic pain syndromes and definitions of pain terms. Prepared by the International Association for the Study of Pain, Subcommittee on Taxonomy. *Pain Suppl.* 1986;3:S1-226. PubMed
5. Brett K, MacDougall D. CADTH Health Technology Review Models of Care for Chronic Pain. Ottawa, ON: CADTH; 2021: https://www.cadth.ca/sites/default/files/es/ES0350%20_to%20Publishing%20Final.pdf. Accessed 2022 Mar 22.
6. Duckworth MP, Iezzi T, Carlson GC. Chronic pain. *Principle-based stepped care and brief psychotherapy for integrated care settings*. Cham, Switzerland: Springer International Publishing/Springer Nature; Switzerland; 2018:129-142.
7. Mental Health Commission of Canada. Newfoundland and Labrador Stepped Care 2.0 e-mental health demonstration project. Ottawa: Health Canada; 2019: https://www.mentalhealthcommission.ca/wp-content/uploads/drupal/2019-09/emental_health_report_eng_0.pdf. Accessed 2022 May 13.
8. Meeuwissen JAC. The case for stepped care: Exploring the applicability and cost-utility of stepped-care strategies in the management of depression [dissertation]. Vrije Universiteit Amsterdam; 2018: https://research.vu.nl/en/publications/the-case-for-stepped-care-exploring-the-applicability-and-cost-ut. Accessed 2022 May 13.
9. van't Veer-Tazelaar PJ, van Marwijk HW, van Oppen P, et al. Stepped-care prevention of anxiety and depression in late life: a randomized controlled trial. *Archives of general psychiatry.* 2009;66(3):297-304. PubMed
10. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *Bmj.* 2006;332(7536):259-263. PubMed
11. Peterson K, Anderson J, Bourne D, Mackey K, Helfand M. Effectiveness of Models Used to Deliver Multimodal Care for Chronic Musculoskeletal Pain: a Rapid Evidence Review. *J Gen Intern Med.* 2018;33(Suppl 1):71-81. PubMed
12. Skelly AC, Chou R, Dettori JR, et al. Integrated and Comprehensive Pain Management Programs: Effectiveness and Harms. Rockville (MD): Agency for Healthcare Research and Quality; 2021: https://effectivehealthcare.ahrq.gov/products/integrated-pain-management/research. Accessed 2022 May 13.
13. Bell L, Cornish P, Gauthier R, et al. Implementation of the Ottawa Hospital Pain Clinic stepped care program: A preliminary report. *Can J Pain.* 2020;4(1):168-178. PubMed
14. Katon W, Russo J, Lin EH, et al. Cost-effectiveness of a multicondition collaborative care intervention: a randomized controlled trial. *Archives of general psychiatry.* 2012;69(5):506-514. PubMed
15. Simon GE, Katon WJ, Lin EH, et al. Cost-effectiveness of systematic depression treatment among people with diabetes mellitus. *Archives of general psychiatry.* 2007;64(1):65-72. PubMed
16. Dickinson KC, Sharma R, Duckart JP, Corson K, Gerrity MS, Dobscha SK. VA healthcare costs of a collaborative intervention for chronic pain in primary care. *Medical care.* 2010:38-44. PubMed
17. Busse JW, Craigie S, Juurlink DN, et al. Guideline for opioid therapy and chronic noncancer pain. *CMAJ.* 2017;189(18):E659-E666. PubMed
18. Sawhney M, Fletcher GG, Rice J, Watt-Watson J, Rawn T. *Guidelines on management of pain in cancer and/or palliative care.* Toronto (ON): Cancer Care Ontario; 2017: https://www.cancercareontario.ca/en/file/60576/download?token=u-u8pL3r.
19. Davis JA, Robinson RL, Le TK, Xie J. Incidence and impact of pain conditions and comorbid illnesses. *J Pain Res.* 2011;4:331-345. PubMed
20. Davis LL, Kroenke K, Monahan P, Kean J, Stump TE. The SPADE Symptom Cluster in Primary Care Patients With Chronic Pain. *Clin J Pain.* 2016;32(5):388-393. PubMed
21. Robbins SR, Melo LRS, Urban H, et al. Effectiveness of Stepped-Care Intervention in Overweight and Obese Patients With Medial Tibiofemoral Osteoarthritis: A Randomized Controlled Trial. *Arthritis Care Res (Hoboken).* 2021;73(4):520-530. PubMed
22. Bair MJ, Ang D, Wu J, et al. Evaluation of Stepped Care for Chronic Pain (ESCAPE) in Veterans of the Iraq and Afghanistan Conflicts: A Randomized Clinical Trial. *JAMA Intern Med.* 2015;175(5):682-689. PubMed
23. Smink AJ, van den Ende CH, Vliet Vlieland TP, et al. Effect of stepped care on health outcomes in patients with osteoarthritis: an observational study in Dutch general practice. *Br J Gen Pract.* 2014;64(626):e538-544. PubMed
24. Edmond SN, Moore BA, Dorflinger LM, et al. Project STEP: Implementing the Veterans Health Administration's stepped care model of pain management. *Pain Med.* 2018;19(suppl_1):S30-S37. PubMed
25. Anderson DR, Zlateva I, Coman EN, Khatri K, Tian T, Kerns RD. Improving pain care through implementation of the Stepped Care Model at a multisite community health center. *J Pain Res.* 2016;9:1021-1029. PubMed

26. Chambers JB, Marks EM, Russell V, Hunter MS. A multidisciplinary, biopsychosocial treatment for non-cardiac chest pain. *Int J Clin Pract.* 2015;69(9):922-927. PubMed

27. Fitzsimmons D, Phillips CJ, Bennett H, et al. Cost-effectiveness of different strategies to manage patients with sciatica. *Pain.* 2014;155(7):1318-1327. PubMed

28. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol.* 2009;62(10):e1-e34. PubMed

29. Smink AJ, Dekker J, Vliet Vlieland TP, et al. Health care use of patients with osteoarthritis of the hip or knee after implementation of a stepped-care strategy: an observational study. *Arthritis Care Res (Hoboken).* 2014;66(6):817-827. PubMed

30. Cosio D, Swaroop S. The use of mind-body medicine in chronic pain management: differential trends and session-by-session changes in anxiety. *Journal of pain management & medicine.* 2016;2(2).

31. Plagge JM, Lu MW, Lovejoy TI, Karl AI, Dobscha SK. Treatment of comorbid pain and PTSD in returning veterans: A collaborative approach utilizing behavioral activation. *Pain Med.* 2013;14(8):1164-1172. PubMed

32. Karp JF, Gao X, Wahed AS, et al. Effect of Problem-Solving Therapy Versus Supportive Management in Older Adults with Low Back Pain and Depression While on Antidepressant Pharmacotherapy. *Am J Geriatr Psychiatry.* 2018;26(7):765-777. PubMed

33. Matthias MS, Miech EJ, Myers LJ, Sargent C, Bair MJ. An expanded view of self-management: patients' perceptions of education and support in an intervention for chronic musculoskeletal pain. *Pain Med.* 2012;13(8):1018-1028. PubMed

34. Kroenke K, Krebs EE, Wu J, Yu Z, Chumbler NR, Bair MJ. Telecare collaborative management of chronic pain in primary care: a randomized clinical trial. *Jama.* 2014;312(3):240-248. PubMed

35. Tierce-Hazard S, Sadarangani T. Optimizing the primary care management of chronic pain through telecare. *Journal of Clinical Outcomes Management.* 2014;21(11):493-495.

36. Guilkey RE, Draucker CB, Wu J, Yu Z, Kroenke K. Acceptability of a telecare intervention for persistent musculoskeletal pain. *J Telemed Telecare.* 2018;24(1):44-50. PubMed

37. De Oliveira Silva D, Pazzinatto MF, Crossley KM, Azevedo FM, Barton CJ. Novel Stepped Care Approach to Provide Education and Exercise Therapy for Patellofemoral Pain: Feasibility Study. *Journal of medical Internet research.* 2020;22(7):e18584. PubMed

38. Skou ST, Roos EM. Good Life with osteoArthritis in Denmark (GLA: D™): evidence-based education and supervised neuromuscular exercise delivered by certified physiotherapists nationwide. *BMC Musculoskelet Disord.* 2017;18(1):1-13. PubMed

39. Rhon DI, Greenlee TA, Fritz JM. The Influence of a Guideline-Concordant Stepped Care Approach on Downstream Health Care Utilization in Patients with Spine and Shoulder Pain. *Pain Med.* 2019;20(3):476-485. PubMed

Appendix 1: Evaluations of Step(s) in Stepped Care Model

Note that this appendix has not been copy-edited.

Documents of studies that evaluated one or more steps in the stepped care approach, rather than the implementation and evaluation of the stepped care model itself, are outside the scope of this review and were not summarized in the review. Studies which evaluated components or steps that were part of the included stepped care models are briefly described in the following paragraphs.

Several studies evaluated individual interventions included in the stepped care model in NCCP and described potential clinical benefits. In brief, a retrospective cohort study assessed the impact of 10-week CBT intervention (compared to Acceptance and Commitment Therapy) as part of a stepped care model on pain severity and global distress in US veterans with chronic pain.[30] An uncontrolled before-after study in US veterans with chronic pain and posttraumatic stress disorder assessed participation in a biopsychosocial evaluation plus up to 8 behavioural activation sessions on pain, mental health and quality of life.[31] An RCT evaluated problem-solving compared to behavioural activation (both in addition to treatment with venlafaxine) as the second step in a stepped model for people 60 years of age and older with comorbid depression and low back pain.[32]

Several studies evaluated interventions included in ESCAPE and described potential clinical benefits. A qualitative study with 26 participants in the ESCAPE intervention group assessed the self-management education of step 2 in the model.[33] An RCT examined the effectiveness[34,35] and acceptability[36] of a telecare intervention, which included nurse telephone contacts and was coupled with automated symptom monitoring, as part of the Stepped Care to Optimize pain Care Effectiveness (compared to usual care) for US veterans with chronic pain.

Two studies[37,38] evaluated the delivery of education and exercise therapy interventions. An RCT[37] assessed 12 weeks of physiotherapist-led (up to 8 sessions) education and exercise therapy delivered face-to-face versus telerehabilitation delivery in participants with chronic patellofemoral pain.[37] An uncontrolled before-after study[38] assessed education (2 to 3 sessions) and supervised exercises (twice weekly for 6 weeks) as the first step in a stepped care model for pain due to knee or hip osteoarthritis.

A retrospective cohort study compared 1-year downstream health care use and medical costs for patients with spine or shoulder pain who received manual therapy only compared to manual therapy and opioid prescriptions as the first step in a stepped care model.[39]

Appendix 2: Documents of Potential Interest

Note that this appendix has not been copy-edited.

Related CADTH Reports

Models of Care for Chronic Pain: CADTH Environmental Scan. Ottawa: CADTH; 2021. https://www.canjhealthtechnol.ca/index.php/cjht/article/download/es0350/es0350. Accessed 14 April 2022.

Tiered Care for Chronic Non-Malignant Pain: A Review of Clinical Effectiveness, Cost-Effectiveness, and Guidelines. Ottawa: CADTH; 2019. https://www.cadth.ca/tiered-care-chronic-non-malignant-pain-review-clinical-effectiveness-cost-effectiveness-and. Accessed 14 April 2022.

Development or Implementation of Stepped Care Model

Bell L, Cornish P, Gauthier R, et al. Implementation of the Ottawa Hospital Pain Clinic stepped care program: A preliminary report. *Can J Pain.* 2020;4(1):168-178. PubMed

Dorflinger L, Moore B, Goulet J, et al. A partnered approach to opioid management, guideline concordant care and the stepped care model of pain management. *J Gen Intern Med.* 2014;29 Suppl 4:870-876. PubMed

Egerton T, Hinman RS, Hunter DJ, et al. PARTNER: a service delivery model to implement optimal primary care management of people with knee osteoarthritis: description of development. *BMJ Open.* 2020;10(10):e040423. PubMed

Smink AJ, Dekker J, Vliet Vlieland TP, et al. Health care use of patients with osteoarthritis of the hip or knee after implementation of a stepped-care strategy: an observational study. *Arthritis Care Res (Hoboken).* 2014;66(6):817-827. PubMed

Systematic Reviews

Cochrane A, Higgins N, FitzGerald O, et al. Early interventions to promote work participation in people with regional musculoskeletal pain: A systematic review and meta-analysis. *Clinical Rehabi.* 2017;31(11):1466-1481. PubMed

Peterson K, Anderson J, Bourne D, Mackey K, Helfand M. Effectiveness of Models Used to Deliver Multimodal Care for Chronic Musculoskeletal Pain: A Rapid Evidence Review. *J Gen Intern Med.* 2018;33(Suppl 1):71-81. PubMed

Skelly AC, Chou R, Dettori JR, et al. Integrated and Comprehensive Pain Management Programs: Effectiveness and Harms. Rockville (MD): Agency for Healthcare Research and Quality; 2021: https://effectivehealthcare.ahrq.gov/products/integrated-pain-management/research Accessed 2022 May 13.

Scoping Review

Birnie KA, Pavlova M, Neville A, et al. Rapid Evidence and Gap Map of virtual care solutions across a stepped care continuum for youth with chronic pain and their families in response to the COVID-19 pandemic. *Pain.* 2021;162(11):2658-2668. PubMed

Guideline Documents

Doctors of BC. Improving Chronic Pain Management in BC. Last updated: June 2017. https://www.doctorsofbc.ca/sites/default/files/2017-07-improvingchronicpainmanagementinbc_id_113423.pdf. Accessed 14 April 2022.

The Dr. Robert Bree Collaborative. Collaborative Care for Chronic Pain Report and Recommendations; 2018. https://www.qualityhealth.org/bree/wp-content/uploads/sites/8/2018/11/Recommendations-Chronic-Pain-Draft-18-1031.pdf. **Accessed 14 April 2022.**

Faculty of Pain Medicine of the Royal College of Anaesthetists. Improving the Lives of People with Complex Chronic Pain: How to Commission Effective Pain Management Services in England; 2020. https://fpm.ac.uk/sites/fpm/files/documents/2020-06/Commissioning%20guidance%20draft%20design%20FINAL_0.pdf. Accessed 14 April 2022.

Interior Health Planning and Strategic Services. Interior Health's Chronic Pain Strategy Recommendations and Actions for Consideration; 2012. https://www.interiorhealth.ca/sites/default/files/PDFS/ih-chronic-pain-strategy.pdf. Accessed 14 April 2022.

Kligler B, Bair MJ, Banerjea R, et al. Clinical Policy Recommendations from the VHA State-of-the-Art Conference on Non-Pharmacological Approaches to Chronic Musculoskeletal Pain. *J Gen Intern Med.* 2018;33(Suppl 1):16-23. PubMed

Ontario Health Quality. Chronic Pain Care for Adults, Adolescents, and Children; 2020. https://www.hqontario.ca/Portals/0/documents/evidence/quality-standards/qs-chronic-pain-quality-standard-en.pdf. **Accessed 14 April 2022.**

Luites JWH, Kuijer P, Hulshof CTJ, et al. The Dutch Multidisciplinary Occupational Health Guideline to Enhance Work Participation Among Low Back Pain and Lumbosacral Radicular Syndrome Patients. J Occup Rehabil. 2021 Jul 27. https://link.springer.com/content/pdf/10.1007/s10926-021-09993-4.pdf. Accessed 14 April 2022.

Conference Abstract

Clune H GW, Hren L. Applying the Stepped Care Model to Chronic Pain Management. Perm J. 2021;Nov(21).

Protocol

Fritz JM, Rhon DI, Teyhen DS, et al. A Sequential Multiple-Assignment Randomized Trial (SMART) for Stepped Care Management of Low Back Pain in the Military Health System: A Trial Protocol. *Pain Med.* 2020;21(Suppl 2):S73-S82. PubMed

Narrative Reviews

Barker S, Urbanek M, Penlington C. Psychological Interventions for Persistent Orofacial Pain. *Prim Dent J.* 2019;7(4):30-35. PubMed

Duckworth MP, Iezzi T, Carlson GC. Chronic pain. Principle-based stepped care and brief psychotherapy for integrated care settings. Cham, Switzerland: Springer International Publishing/Springer Nature; Switzerland; 2018:129-142.

Chronic Pain Among Service Members Using Administrative Data to Strengthen Research and Quality Improvement; 2021. https://www.rand.org/pubs/research_reports/RRA1160-1.html. Accessed 14 April 2022.

Gallagher RM. Advancing the Pain Agenda in the Veteran Population. *Anesthesiol Clin.* 2016;34(2):357-378. PubMed

Kongsted A, Kent P, Quicke JG, Skou ST, Hill JC. Risk-stratified and stepped models of care for back pain and osteoarthritis: are we heading towards a common model? *Pain rep.* 2020;5(5):e843. PubMed

Linton SJ, Nicholas M, Shaw W. Why wait to address high-risk cases of acute low back pain? A comparison of stepped, stratified, and matched care. *Pain.* 2018;159(12):2437-2441. PubMed

McCulloch Gallagher R, Sandbrink F. The Socioeconomic Burden of Pain From War. *American Journal of Public Health.* 2019;109(1):41-45. PubMed

Sharpe L. Psychosocial management of chronic pain in patients with rheumatoid arthritis: challenges and solutions. *J Pain Res.* 2016;9:137-146. PubMed

Speed TJ, Parekh V, Coe W, Antoine D. Comorbid chronic pain and opioid use disorder: literature review and potential treatment innovations. *Int Rev Psychiatry.* 2018;30(5):136-146. PubMed

U.S. Department of Veterans Affairs. Stepped-care and collaborative-care models for chronic musculoskeletal pain; 2018. https://www.research.va.gov/research_in_action/Stepped-care-and-collaborative-care-models-for-chronic-musculoskeletal-pain.cfm. Access 14 April 2022.