QUERI

Evidence Brief: Effectiveness of Models Used to Deliver Multimodal Care for Chronic Musculoskeletal Pain

Supplemental Materials

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VA HEALTH CARE Defining EXCELLENCE in the 21st Century

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APPENDIX A: SEARCH STRATEGIES

Database: Ovid MEDLINE (October 6, 2016)

Database: Ovid MEDLINE(R) without Revisions <1996 to September Week 4 2016>
Search Strategy:
---

1 exp Disease Management/ (32626)
2 exp "Delivery of Health Care"/ (673565)
3 *primary health care/ (30397)
4 *patient care planning/ or *case management/ (10756)
5 *patient care management/ or *delivery of health care/ or *delivery of health care, integrated/ or *managed care programs/ or *disease management/ or *patient care team/ or *quality of health care/ (94114)
6 *Health Services/ut [Utilization] (3096)
7 (collaborative adj (management or care)).tw. (1278)
8 (management adj5 care).tw. (20170)
9 models, organizational/ or total quality management/ (24515)
10 organizational innovation/ (17818)
11 (outcome and process assessment).mp. (16379)
12 Program evaluation/ (45143)
13 exp Evidence-Based Medicine/ (61578)
14 (disease adj manag$).tw. (8696)
15 (multifaceted adj intervention$).tw. (680)
16 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 (858597)
17 (chronic pain or non-cancer pain or neck pain or shoulder pain or back pain or low back pain or elbow pain or hip pain or knee pain or ankle pain).tw. (54951)
18 16 and 17 (8627)
19 limit 18 to (english language and humans) (7720)
20 limit 19 to (clinical study or clinical trial, all or clinical trial or comparative study or controlled clinical trial or evaluation studies or meta analysis or multicenter study or observational study or pragmatic clinical trial or randomized controlled trial or systematic reviews) (2943)
21 self-management.ti,ab. (8734)
22 (self adj manage$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (9305)
23 (stepped adj care).ti,ab. (597)
24 exp Decision Support Systems, Clinical/ (5779)
25 (integrat$ adj care).ti,ab. (2031)
26 algorithm$.ti,ab. (121876)
27 7 or 8 or 15 or 21 or 22 or 23 or 24 or 25 or 26 (158626)
28 17 and 27 (1107)
29 limit 28 to (english language and humans and (clinical study or clinical trial, all or clinical trial or comparative study or controlled clinical trial or meta analysis or multicenter study or observational study or pragmatic clinical trial or randomized controlled trial or systematic reviews)) (386)

Database: CINAHL (October 13, 2016)

Search ID#	Search Terms	Search Options	Results
S42	S22 AND S41	Limiters - English Language; Human; Publication Type: Clinical Trial, Meta Analysis, Meta Synthesis, Randomized Controlled Trial, Research, Systematic Review Search modes - Boolean/Phrase	589
S41	S38 OR S40	Search modes - Boolean/Phrase	84,542
S40	integrat* N1 care	Search modes - Boolean/Phrase	10,001
S39	S22 AND S38	Limiters - English Language; Human; Publication Type: Clinical Trial, Meta Analysis, Meta Synthesis, Randomized Controlled Trial, Research, Systematic Review Search modes - Boolean/Phrase	565
S38	S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37	Search modes - Boolean/Phrase	Display
S37	(MH "Case Management")	Search modes - Boolean/Phrase	Display
S36	algorithm*	Search modes - Boolean/Phrase	33,175
S35	(MH "Decision Support Systems, Clinical")	Search modes - Boolean/Phrase	2,995
S34	stepped N1 care	Search modes - Boolean/Phrase	349
S33	(self N1 manage*)	Search modes - Boolean/Phrase	Display
S32	self-management	Search modes - Boolean/Phrase	Display
S31	(multi-component or multicomponent) N1 intervention	Search modes - Boolean/Phrase	Display
S30	(multi-component or multicomponent) N1 care	Search modes - Boolean/Phrase	Display
S29	(multi-faceted OR multifaceted) N1 intervention	Search modes - Boolean/Phrase	Display
S28	(multi-faceted OR multifaceted) N1 care	Search modes - Boolean/Phrase	Display
S27	complex N1 intervention	Search modes - Boolean/Phrase	Display
S26	multimodal N1 (care or intervention)	Search modes - Boolean/Phrase	Display
S25	multi-modal N1 (care or intervention)	Search modes - Boolean/Phrase	Display
S24	(management N5 care)	Search modes - Boolean/Phrase	Display
S23	collaborative N1 (management OR care)	Search modes - Boolean/Phrase	Display
S22	chronic pain or non-cancer pain or neck pain or shoulder pain or back pain or low back pain or elbow pain or hip pain or knee pain or ankle pain	Search modes - Boolean/Phrase	Display

S21	S1 AND S20	Limiters - English Language; Human; Publication Type: Clinical Trial, Meta Analysis, Meta Synthesis, Randomized Controlled Trial, Research, Systematic Review Search modes - Boolean/Phrase	589
S20	S17 OR S19	Search modes - Boolean/Phrase	84,542
S19	integrat* N1 care	Search modes - Boolean/Phrase	10,001
S18	S1 AND S17	Limiters - English Language; Human; Publication Type: Clinical Trial, Meta Analysis, Meta Synthesis, Randomized Controlled Trial, Research, Systematic Review Search modes - Boolean/Phrase	565
S17	S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16	Search modes - Boolean/Phrase	75,575
S16	(MH "Case Management")	Search modes - Boolean/Phrase	Display
S15	algorithm*	Search modes - Boolean/Phrase	Display
S14	(MH "Decision Support Systems, Clinical")	Search modes - Boolean/Phrase	Display
S13	stepped N1 care	Search modes - Boolean/Phrase	Display
S12	(self N1 manage*)	Search modes - Boolean/Phrase	Display
S11	self-management	Search modes - Boolean/Phrase	Display
S10	(multi-component or multicomponent) N1 intervention	Search modes - Boolean/Phrase	Display
S9	(multi-component or multicomponent) N1 care	Search modes - Boolean/Phrase	Display
S8	(multi-faceted OR multifaceted) N1 intervention	Search modes - Boolean/Phrase	525
S7	(multi-faceted OR multifaceted) N1 care	Search modes - Boolean/Phrase	Display
S6	complex N1 intervention	Search modes - Boolean/Phrase	Display
S5	multimodal N1 (care or intervention)	Search modes - Boolean/Phrase	Display
S4	multi-modal N1 (care or intervention)	Search modes - Boolean/Phrase	Display
S3	(management N5 care)	Search modes - Boolean/Phrase	Display
S2	collaborative N1 (management OR care)	Search modes - Boolean/Phrase	Display
S1	chronic pain or non-cancer pain or neck pain or shoulder pain or back pain or low back pain or elbow pain or hip pain or knee pain or ankle pain	Search modes - Boolean/Phrase	Display

Systematic Review Searching (October 20, 2016)

1. Search for current systematic reviews (limited to last 5 years) ***Search terms: Chronic pain, chronic musculoskeletal pain, musculoskeletal pain, chronic noncancer pain***	
A. Required sources:	**Evidence:**
AHRQ: evidence reports, technology assessments, U.S Preventative Services Task Force Evidence Synthesis	http://www.ahrq.gov/research/findings/evidence-based-reports/search.html Search: *Chronic pain, chronic musculoskeletal pain, musculoskeletal pain, chronic noncancer pain* Relevant results: Jeffery 2010, Multidisciplinary Pain Programs for Chronic Noncancer Pain
CADTH	https://www.cadth.ca Search: *Chronic pain, chronic musculoskeletal pain, musculoskeletal pain, chronic noncancer pain* Relevant results: Multidisciplinary Chronic Non-Cancer Pain Programs for Adults: Guidelines for Referral, Treatment Management and Program Duration Multidisciplinary Treatment Programs for Patients with Non-Malignant Pain: A Review of the Clinical Evidence, Cost-Effectiveness, and Guidelines
Cochrane Database of Systematic Reviews: Protocols & Reviews	http://www.ohsu.edu/xd/education/library/ (search through Ovid) Database: Global Health <1973 to 2016 Week 40>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to October 19, 2016> Search Strategy: --- 1 chronic musculoskeletal pain.mp. [mp=ab, ti, ot, bt, hw, id, cc, tx, kw, ct] (63) 2 chronic noncancer pain.mp. [mp=ab, ti, ot, bt, hw, id, cc, tx, kw, ct] (11) 3 Multidisciplinary Pain Program*.mp. [mp=ab, ti, ot, bt, hw, id, cc, tx, kw, ct] (1) 4 multimodal pain program*.mp. [mp=ab, ti, ot, bt, hw, id, cc, tx, kw, ct] (0) 5 multimodal pain.mp. [mp=ab, ti, ot, bt, hw, id, cc, tx, kw, ct] (11) 6 Multidisciplinary Pain.mp. [mp=ab, ti, ot, bt, hw, id, cc, tx, kw, ct] (17) ********** Relevant results: Multidisciplinary rehabilitation for fibromyalgia and musculoskeletal pain in working age adults Multidisciplinary treatment for chronic pain: a systematic review of interventions and outcomes Multidisciplinary Biopsychosocial Rehabilitation for Nonspecific Chronic Low Back Pain Multidisciplinary biopsychosocial rehabilitation for neck and shoulder pain among working age adults
ECRI Institute	https://www.ecri.org/Pages/default.aspx Relevant results: None found

HTA: Health Technology Assessments	http://www.ohsu.edu/xd/education/library/ (search through Ovid) Database: EBM Reviews - Health Technology Assessment <3rd Quarter 2016> Search Strategy: --- 1 chronic musculoskeletal pain.mp. (5) 2 chronic noncancer pain.mp. (2) 3 multimodal pain.mp. (0) 4 Multidisciplinary Pain.mp. (4) ********** Relevant results: Multidisciplinary pain programs for chronic pain: evidence from systematic reviews (Structured abstract) Ospina, M. Harstall, C. Health Technology Assessment Database. 2016 Issue 3, John Wiley & Sons, Ltd. Chichester, UK. Division: ST. AN: HTA-32003000442 Reviewed Source Original article: Ospina, M, Harstall, C. Multidisciplinary pain programs for chronic pain: evidence from systematic reviews. Edmonton: Alberta Heritage Foundation for Medical Research (AHFMR). 53p. 2003.

MEDLINE: Systematic Reviews	http://www.ohsu.edu/xd/education/library/ Database: Ovid MEDLINE(R) <1946 to October Week 2 2016>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <October 19, 2016> Search Strategy: --- 1 meta-analysis.pt. (74417) 2 meta-analysis/ or systematic review/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/ (98559) 3 ((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or overview*))).ti,ab. (99987) 4 ((quantitative adj3 (review* or overview* or synthes*)) or (research adj3 (integrati* or overview*))).ti,ab. (7269) 5 ((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or (pool* adj3 analy*)).ti,ab. (16413) 6 (data synthes* or data extraction* or data abstraction*).ti,ab. (17867) 7 (handsearch* or hand search*).ti,ab. (7456) 8 (mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin square*).ti,ab. (18634) 9 (meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw. (179119) 10 (meta regression* or metaregression*).ti,ab. (4624) 11 (meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw. (179119) 12 (medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw. (134724) 13 (cochrane or (health adj2 technology assessment) or evidence report).jw. (20466) 14 (meta-analysis or systematic review).ti,ab. (136954) 15 (comparative adj3 (efficacy or effectiveness)).ti,ab. (9081) 16 (outcomes research or relative effectiveness).ti,ab. (6063) 17 ((indirect or indirect treatment or mixed-treatment) adj comparison*).ti,ab. (1367) 18 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 (298765) 19 chronic noncancer pain.mp. (496) 20 multimodal pain.mp. (332) 21 multidisciplinary pain.mp. (585) 22 chronic pain/pp [physiopathology] (1197) 23 chronic Musculoskeletal pain.mp. (791) 24 pain management.mp. (37522) 25 18 and (19 or 20 or 21 or 22 or 23) (224) ********** Relevant Results: A systematic review of the outcomes reported in multimodal pain therapy for chronic pain. [Review] Deckert, S; Kaiser, U; Kopkow, C; Trautmann, F; Sabatowski, R; Schmitt, J. Source: European Journal of Pain. 20(1):51-63, 2016 Jan. Validation and application of a core set of patient-relevant outcome domains to assess the effectiveness of multimodal pain therapy (VAPAIN): a study protocol. Kaiser, Ulrike; Kopkow, Christian; Deckert, Stefanie; Sabatowski, Rainer; Schmitt, Jochen. Is There a Need for Including Spiritual Care in Interdisciplinary Rehabilitation of Chronic Pain Patients? Investigating an Innovative Strategy. [Review] Garschagen A; Steegers MA; van Bergen AH; Jochijms JA; Skrabanja TL; Vrijhoef HJ; Smeets RJ; Vissers KC. Pain Practice. 15(7):671-87, 2015 Sep. Literature review of pain management for people with chronic pain. [Review] Takai Y; Yamamoto-Mitani N; Abe Y; Suzuki M. Japan Journal of Nursing Science: JJNS. 12(3):167-83, 2015 Jul. Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. Flor H; Fydrich T; Turk DC.

	Pain. 49(2):221-30, 1992 May. [Multimodal pain therapy. Current situation]. [German] Kaiser U; Sabatowski R; Azad SC. Der Schmerz. 29(5):550-6, 2015 Oct.
NHS Evidence	http://www.evidence.nhs.uk/default.aspx Search: *Multidisciplinary chronic musculoskeletal pain, multimodal chronic musculoskeletal pain* Relevant results: Same as Cochrane Database of Systematic Reviews
NLM	https://www.nlm.nih.gov/ Search: *Multidisciplinary chronic musculoskeletal pain, multimodal chronic musculoskeletal pain* Relevant results: None found

Additional sources searched (November 1, 2016)

General Databases	
Sources:	**Evidence:**
CADTH Grey Matters	https://www.cadth.ca/resources/finding-evidence/grey-matters Search: Chronic pain, chronic musculoskeletal pain, musculoskeletal pain, chronic noncancer pain Relevant results: None
Conference Papers Index	http://library.pdx.edu/dofd/subjects Search: (all(chronic musculoskeletal pain) OR all(chronic noncancer pain) OR all(chronic pain)) AND (all(multimodal) OR all(Multidisciplinary) OR all(pain program)) Relevant results: None
Grey Literature Report	http://www.greylit.org/home Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: Multidisciplinary pain programs for chronic noncancer pain. AHRQ. (already pulled)
Clinical Trials	https://www.clinicaltrials.gov/ Search: chronic pain OR musculoskeletal pain OR chronic noncancer pain | multimodal OR multidisciplinary OR collaborative | Adult, Senior | Studies that accept healthy volunteers Relevant results: Chronic Pain Care Network (NSCPCCN) Comparison of Two Multidisciplinary Rehabilitation Interventions in Patients With Chronic Low Back Pain Relational world of chronic pain patients in the course of an inpatient multimodal pain treatment focusing on psychosomatic interventions Nationwide Evaluation of Multimodal Rehabilitation in Patients With Chronic Musculoskeletal Pain

Clinical Trial Results	www.clinicaltrialresults.org/ Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: None
WHO International Clinical Trials Registry Platform	http://apps.who.int/trialsearch/default.aspx Search: (chronic musculoskeletal pain OR chronic noncancer pain OR chronic pain) AND (multimodal) OR Multidisciplinary OR pain program) Relevant results: None
RePORT Research Portfolio Online Reporting Tools provides a central point of access to reports, data, and analyses of NIH research	https://projectreporter.nih.gov/reporter.cfm Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: COLLABORATIVE CARE FOR CHRONIC PAIN IN PRIMARY CARE (2012) COLLABORATIVE CARE FOR CHRONIC PAIN IN PRIMARY CARE (2014) COLLABORATIVE CARE FOR CHRONIC PAIN IN PRIMARY CARE (2015) COLLABORATIVE CARE FOR CHRONIC PAIN IN PRIMARY CARE (2016)
National Repository of Grey Literature (NRGL)	http://www.nusl.cz/?lang=en Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: None
OpenGrey Repository System for Information on Grey Literature in Europe	http://www.opengrey.eu/ Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: Chronic low back pain Effectiveness of pain management programmes
Trip Turning Research Into Practice. Trip is a clinical search engine	https://www.tripdatabase.com/ Search: (title:chronic musculoskeletal pain)(title:management or collaborative or multimodal or multidisciplinary) Relevant results: Dawn Ernstzen, Quinette Louw, Susan Hillier. Clinical practice guidelines for the management of chronic musculoskeletal pain in primary health care: a systematic review. PROSPERO 2015:CRD42015022098 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42015022098
metaRegister of Controlled Trials (mRCT)	http://www.isrctn.com/page/mrct Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: **None**

National Institute for Health and Care Excellence (NICE Guidelines)	https://www.nice.org.uk/guidance?action=find Search: chronic musculoskeletal pain, multimodal, chronic pain management, collaborative pain management, Chronic pain, musculoskeletal pain Relevant results: **None**
Scopus (limit to conference procedings)	http://libguides.ohsu.edu/az.php?a=s Search: (all(chronic musculoskeletal pain) OR all(chronic noncancer pain) OR all(chronic pain)) AND (all(multimodal) OR all(Multidisciplinary) OR all(pain program)) Relevant results: **None**
Google Scholar	http://scholar.google.com/ Search: chronic musculoskeletal pain management, Collaborative Management of Chronic musculoskeletal Pain, related articles for Hill 2011, Kroenke 2014, multimodal Care for Chronic musculoskeletal pain, multidisciplinary pain management for Chronic musculoskeletal pain Relevant results: Update on guidelines for the treatment of chronic musculoskeletal pain Med Care. 2010 Jan;48(1):38-44. doi: 10.1097/MLR.0b013e3181bd49e2. VA healthcare costs of a collaborative intervention for chronic pain in primary care. Dickinson KC1, Sharma R, Duckart JP, Corson K, Gerrity MS, Dobscha SK. Wiedemer, N. L., Harden, P. S., Arndt, I. O. and Gallagher, R. M. (2007), The Opioid Renewal Clinic: A Primary Care, Managed Approach to Opioid Therapy in Chronic Pain Patients at Risk for Substance Abuse. Pain Medicine, 8: 573–584. doi:10.1111/j.1526-4637.2006.00254.x Von Korff M, Moore JC. Stepped Care for Back Pain: Activating Approaches for Primary Care. Ann Intern Med. 2001;134:911-917. doi: 10.7326/0003-4819-134-9_Part_2-200105011-00016 A primary care, multi-disciplinary disease management program for opioid-treated patients with chronic non-cancer pain and a high burden of psychiatric comorbidity The VHA's National Pain Management Strategy: implementing the stepped care model PH Rosenberger, EJ Philip, A Lee, RD Kerns - Fed Pract, 2011
Google	http://www.google.com/ Search: multidisciplinary pain management for Chronic musculoskeletal pain, collaborative pain management for Chronic musculoskeletal pain, systems level management of chronic musculoskeletal pain Relevant results: Veterans' Mates Therapeutic Brief- Chronic Musculoskeletal Pain: Changing the way we think about pain Towards a Multidisciplinary Team Approach in Chronic Pain Management Evaluation of a multicomponent programme for the management of musculoskeletal pain and depression in primary care: a cluster-randomised clinical trial (the DROP study)

Additional Sources Searched (November 11, 2016)

Topic Specific Sources	
Sources:	**Evidence:**
American Pain Society	http://americanpainsociety.org/education/guidelines/overview Guidelines: -March 2013- Use of Opioids for the Treatment of Chronic Pain: A statement from the American Academy of Pain Medicine (http://www.painmed.org/files/use-of-opioids-for-the-treatment-of-chronic-pain.pdf) -July 2016-Recommended Prescriber Practices from the American Academy of Pain for Methadone use to treat chronic pain -Spine Intervention Society: Appropriate Use Criteria for Fluoroscopically-Guided Diagnostic and Therapeutic Sacroiliac Interventions (spine injections) (http://1515docs.org/AUC/SI%20AUC%20Backgrounder.pdf)
PCORI	http://www.pcori.org/ Chronic Pain Management Workgroup. Stakeholder Workshop: Management of Chronic Musculoskeletal Pain http://www.pcori.org/events/2015/prioritizing-comparative-effectiveness-research-questions-systems-interventions-improve Topic Brief: http://www.pcori.org/sites/default/files/PCORI-Workshop-Topic-Brief-Musculoskeletal-Pain-060915.pdf Erin Krebs, University of Minnesota, awarded 2016: Comparative Effectiveness of Patient-Centered Strategies to Improve Pain Management and Opioid Safety for Veterans http://www.pcori.org/research-results/2016/comparative-effectiveness-patient-centered-strategies-improve-pain-management Paula Gardiner, Boston Medical Center, awarded 2013 (recruiting): Integrative Medicine Group Visits: A Patient-Centered Approach to Reducing Chronic Pain and Depression in a Disparate Urban Population http://www.pcori.org/research-results/2013/integrative-medicine-group-visits-patient-centered-approach-reducing-chronic
University of Southern California	Pain updates an medical news, but last update in 2007 (http://www.helpforpain.com/helpforpain.htm) New Medicines for Pain Treatment, last update in 2002 (http://www.helpforpain.com/helpforpain.htm)

American Academy of Pain Management (partner organizations: Arizona Center for Integrative Medicine, Integrative Health Policy Consortium, University of New Mexico, etc)	Research Abstracts (http://www.aapainmanage.org/resources/research-abstracts/) -Published research: October 2015, Exposure to High-Risk Medications is Associated with Worse Outcomes In Older Veterans with Chronic Pain Practice Guidelines (search by pain area): http://www.aapainmanage.org/resources/practice-guidelines/page/3/) -July 2015-US Dept of Health & Human Services, Low Back Pain Medical Treatment Guidelines (http://www.aapainmanage.org/resources/practice-guideline/low-back-pain-medical-treatment-guidelines-2/) -June 2015-Published in Pain Physician, Low Back Pain: Guidelines for Clinical Classification of Predominant Neuropathic, Nociceptive, or Central Sensitization Pain (http://www.aapainmanage.org/resources/practice-guideline/low-back-pain-guidelines-for-clinical-classification-of-predominant-neuropathic-nociceptive-or-central-sensitization-pain/) -February 2015- VA/DoD clinical practice guideline for the non-surgical management of hip & knee osteoarthritis (http://www.aapainmanage.org/resources/practice-guideline/vadod-clinical-practice-guideline-for-the-non-surgical-management-of-hip-knee-osteoarthritis/) Clinical Trials (search by pain area, city, state: http://www.aapainmanage.org/resources/clinical-trials/) Legislation and Regulation: http://www.aapainmanage.org/advocacy/legislation-and-regulation/
Australian Government	Australian Government on chronic pain management for Australian vets: https://www.veteransmates.net.au/topic-38-therapeutic-brief. Some of the references listed in this may be useful: -2010 National Pain Strategy: includes proposed models of care, multi-modal treatment, musculoskeletal and benefits of education on patient outcomes, etc http://www.painaustralia.org.au/the-national-pain-strategy/national-painstrategy.html - Scascighini L. et al. Multidisciplinary treatment for chronic pain: a systematic review of interventions and outcomes. Rheumatology. 2008; 47: 670-678. http://rheumatology.oxfordjournals.org/content/47/5/670.long - Veehof M. et al. Acceptance-based interventions for the treatment of chronic pain: a systematic review and meta-analysis. Pain. 2011; 152: 533-542. http://www.sciencedirect.com/science/article/pii/S0304395910006871 - Morley S, Eccleston C & Williams A. Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. Pain. 1999; 80: 1-13. - Mason L. et al. Topical NSAIDs for chronic musculoskeletal pain: systematic review and meta-analysis. BMC Musculoskeletal Disorders. 2004; 5: 28-36. - Gauntlett-Gilbert J. & Wilson S. Veterans and chronic pain. British Journal of Pain. May 2013. Available at: http://bjp.sagepub.com/content/7/2/79.full.pdf+html [Accessed September 2013].
American Chronic Pain Association	https://theacpa.org/ -advertises, “Vets in Pain” events Relevant results: None
The Pain Community	http://paincommunity.org/ Relevant results: None
Project TeleECHO (ECHO Pain)	-Project ECHO: bridges gap between primary and specialty care, adopted by US Army as part of a comprehensive pain management program (http://echo.unm.edu/initiatives/armed-services/)

BackCare	www.backcare.org.uk Search: multidisciplinary pain management for Chronic musculoskeletal pain, collaborative pain management for Chronic musculoskeletal pain Relevant results: None
Pain Association Scotland	http://www.painassociation.com/ Relevant results: None
VA HSR&D publications	http://www.hsrd.research.va.gov/research/default.cfm Search: chronic pain, Kroenke, musculoskeletal Relevant Results: IIR 14-070 Evaluation of a peer Coach-Led Intervention to improve Pain Symptoms (ECLIPSE) - Matthias IIR 09-058 IVR-based Cognitive Behavior Therapy for Chronic Low Back - Heapy IIR 10-128 Care Management for the Effective Use of Opioids (CAMEO) IIR 13-030 A proactive walking trial to reduce pain in Black Veterans– Diana Burgess PMI 03-195 Improving the Treatment of Chronic Pain in Primary Care RRP 12-438 Improving Pain using Peer RE-inforced Self-management Skills (IMPPRESS) TRX 04-402 Decision Support for the Management of Opioid Therapy in Chronic Pain: Jodie Trafton IIR 09-062 Musculoskeletal Spine Pain in VA: Description and Guideline Adherence

APPENDIX B: LIST OF EXCLUDED STUDIES

Exclude reasons: 1=Ineligible population, 2=Ineligible intervention, 3=Ineligible comparator, 4=Ineligible outcome, 5=Ineligible timing, 6=Ineligible study design, 7=Ineligible publication type, 8=Outdated or ineligible systematic review, 9=Protocol for eligible study

#	Citation	Exclude reason
1.	Andersen LN, Juul-Kristensen B, Sorensen TL, Herborg LG, Roessler KK, Sogaard K. Efficacy of Tailored Physical Activity or Chronic Pain Self-Management Programme on return to work for sick-listed citizens: A 3-month randomised controlled trial. *Scandinavian Journal of Public Health.* Nov 2015;43(7):694-703.	E(1)
2.	Apeldoorn AT, Ostelo RW, van Helvoirt H, et al. A randomized controlled trial on the effectiveness of a classification-based system for subacute and chronic low back pain. *Spine (03622436).* 2012;37(16):1347-1356.	E(1)
3.	Becker WC, Meghani SH, Barth KS, Wiedemer N, Gallagher RM. Characteristics and outcomes of patients discharged from the Opioid Renewal Clinic at the Philadelphia VA Medical Center. *American Journal on Addictions.* 2009;18(2):135-139.	E(4)
4.	Beneciuk JM, George SZ. Pragmatic Implementation of a Stratified Primary Care Model for Low Back Pain Management in Outpatient Physical Therapy Settings: Two-Phase, Sequential Preliminary Study. *Physical Therapy.* Aug 2015;95(8):1120-1134.	E(1)
5.	Briggs M, Closs SJ, Marczewski K, Barratt J. A feasibility study of a combined nurse/pharmacist-led chronic pain clinic in primary care. *Quality in Primary Care.* 2008;16(2):91-94.	E(6)
6.	Bronfort G, Maiers M, Evans R, Westrom K. P02.129. Individualized chiropractic and integrative care for low back pain: a randomized clinical trial. *BMC Complementary & Alternative Medicine.* 2012;12(Suppl 1):1-1.	E(1)
7.	Bültmann U, Sherson D, Olsen J, Hansen CL, Lund T, Kilsgaard J. Coordinated and tailored work rehabilitation: a randomized controlled trial with economic evaluation undertaken with workers on sick leave due to musculoskeletal disorders. *Journal of Occupational Rehabilitation.* 2009;19(1):81-93.	E(1)
8.	Carnes D, Homer KE, Miles CL, et al. Effective Delivery Styles and Content for Self-management Interventions for Chronic Musculoskeletal Pain: A Systematic Literature Review. *Clinical Journal of Pain.* 2012;28(4):344-354.	E(2)
9.	Chiauzzi E, Pujol LA, Wood M, et al. painACTION-back pain: a self-management website for people with chronic back pain. *Pain Medicine.* Jul 2010;11(7):1044-1058.	E(2)
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APPENDIX C: EVIDENCE TABLES

DATA ABSTRACTION OF INCLUDED PRIMARY STUDIES

Data Abstraction: Study Characteristics

Author **Year** **N** **Study Design** **Setting** **Follow-up**	**Patient Characteristics** (1) % male (2) mean age (3) % white	**Pain Characteristics** (1) Most common location (% patients) (2) Mean duration (y) (3) Pain intensity (mean score on 10-pt scale) (4) % taking opioid	**Current Comorbidities** (1) MDD (2) Anxiety (3) PTSD (4) SUD (5) Medical	**Clinically significant* improvement in: Pain Intensity or Pain-related Function** **(Intervention vs Control)**	**QOL** **Depression** **Anxiety** **Sleep** **Opioid Dose** **(Intervention vs Control)**	**Unintended Consequences** **(Intervention vs Control)**
Ahles 2001[1] 396 RCT New Hampshire and Vermont 6 months	(1) 39% male (2) 49 years (3) NR	(1) NR (2) NR (3) NR (4) NR	(1) NR (2) NR (3) NR (4) NR (5) Fair or Poor Health (28%)	NR	SF-36 Role Physical: 54.8 vs 37.5, P<0.03 SF-36 Role Emotional: 81.9 vs 62.0, P<0.001 SF-36 Role Social: 79.5 vs 64.5, P<0.001	NR
Ahles 2006[2] 1066 RCT New Hampshire, Vermont, and Maine 12 months	(1) 48% male (2) 48 years (3) 94% white	(1) NR (2) NR (3) NR (4) NR	(1) NR (2) NR (3) NR (4) 1% (5) Serious obesity (19%)	NR	SF-36 Role Emotional: 13.9 vs 3.8, P=0.046 SF-36 Vitality: 7.4 vs 3.7, P=0.048 Mean change within groups	NR
Angeles 2013[3] 63 RCT Canada 6 months	(1) 38% male (2) 55 years (3) NR	(1) NR (2) NR (3) NR (4) NR	(1) NR (2) NR (3) NR (4) Possible or probable SUD (19.3%) CAGE-AID (5) Pain due to disease process (59.7%)	NR	SF-36 Role Physical: -15.3 vs 3.4, P=0.01 SF-36 Role emotional: 2.6 vs 3.7 P=.92 SF-36 Social functioning: 3.2 vs 2.7, P=0.95 SF-36 mental component: 3.6 vs 3.6, P=1.0	NR

Author **Year** **N** **Study Design** **Setting** **Follow-up**	**Patient Characteristics** (1) % male (2) mean age (3) % white	**Pain Characteristics** (1) Most common location (% patients) (2) Mean duration (y) (3) Pain intensity (mean score on 10-pt scale) (4) % taking opioid	**Current Comorbidities** (1) MDD (2) Anxiety (3) PTSD (4) SUD (5) Medical	**Clinically significant* improvement in: Pain Intensity or Pain-related Function** **(Intervention vs Control)**	**QOL** **Depression** **Anxiety** **Sleep** **Opioid Dose** **(Intervention vs Control)**	**Unintended Consequences** **(Intervention vs Control)**
Bair 2015[4] 241 VA 9 months	(1) 88% male (2) 37 years (3) 77% white	(1) Low Back (57%) (2) NR (3) 6.6 (GCPS Severity Score) (4) 39%	(1) Mean score[a] = 11.2 (2) NR (3) Mean score[b] = 26.4 (4) NR (5) No. of Medical Diseases, mean= 0.94	RMDQ: RR=1.52 (95% CI 1.22 to 1.99) NNT=7.5	PHQ-9 (Depression): 11.1/27 vs 11.3/27	NR
Burnham 2010[5] 82 Retrospective Cohort Canada 18 months	(1) 31% male (2) 47 years (3) NR	(1) NR (2) 8.2y (3) 7.7 (4) NR	(1) NR (2) NR (3) NR (4) NR (5) NR	NR	NR	NR
Dobscha 2009[6] 401 RCT VA 12 months	(1) 92% male (2) 62 years (3) 89% white	(1) 67% back, 65% neck or joint (2) NR (3) 5.2 (4) 43%	(1) 18% (2) 13% (PRIME-MD) (3) 16% (4) 16% (5) 4.9 (RxRisk-V medical morbidity score, range 0 to 45)	RMDQ: 21.9% vs 14.0%, P=0.04 NNT=12.70 (95% CI 12.48 to 12.74)	Mean change in EQ-5D: -0.02 (95% CI -0.05 to 0.01) vs -0.04 (95% CI -0.05 to -0.02), p=0.17 Mean change in PHQ-9: -3.7 (95%CI -4.9 to -0.24) vs -1.2 (95% CI -4.9 to -2.4), p=0.003 Any opioid prescribed: 65% vs 61%, p=0.56	Mean change global treatment satisfaction: -0.27 (95% CI -0.41 to -0.12) vs -0.36 (95% CI -0.51 to -0.22), p=0.44
Hay 2006[7] 216 RCT England 12 months	(1) 36% male (2) 62 years (3) NR	(1) 100% knee (2) NR (3) 6.1 (4) NR	(1) NR (2) NR (3) NR (4) NR (5) NR	OMERACT-OARSI response as high improvement: 27% vs 28%; P=0.8	Difference in change in HADS depression (control-intervention): 0.01 (95% CI -0.7 to 0.7) Difference in change in HADS anxiety (control-intervention): -0.23 (95% CI -1.1 to 0.6)	Satisfaction with treatment (control-intervention): -19% (95% CI -32 to -4)

Author **Year** **N** **Study Design** **Setting** **Follow-up**	**Patient Characteristics** (1) % male (2) mean age (3) % white	**Pain Characteristics** (1) Most common location (% patients) (2) Mean duration (y) (3) Pain intensity (mean score on 10-pt scale) (4) % taking opioid	**Current Comorbidities** (1) MDD (2) Anxiety (3) PTSD (4) SUD (5) Medical	**Clinically significant* improvement in: Pain Intensity or Pain-related Function** **(Intervention vs Control)**	**QOL** **Depression** **Anxiety** **Sleep** **Opioid Dose** **(Intervention vs Control)**	**Unintended Consequences** **(Intervention vs Control)**
Hill 2011[8] 851 RCT England 12 months	(1) 41% male (2) 50 years (3) NR	(1) 100% low back (2) NR (3) 5.3 (do not give scale range) (4) NR	(1) NR (2) NR (3) NR (4) NR (5) NR	RMDQ: 65% vs 57%; OR=1.48 (95% CI 1.02 to 2.15) NNT=10.8 (95% CI 5.8 to 206)	Difference in mean change SF-12: Physical: -2.93 (95% CI -4.31 to -1.56) Mental: -0.69 (95% CI -2.39 to 1.01) Difference in mean change HADS: Depression: 0.62 (95% CI 0.07 to 1.17) Anxiety: 0.45 (95% CI -0.10 to 1.01)	Satisfaction with care (intervention vs control): not satisfied: 27% vs 36%
Kroenke 2009[9] 250 RCT VA 12 months	(1) 47% male (2) 56 years (3) 60% white	(1) 60% back, 40% hip or knee (2) 9y (3) 6.2 (BPI) (4) 45%	(1) 75% (2) Mean score: 8.9/21 (GAD-7) (3) NR (4) NR (5) 2.7 (mean # medical illnesses),	BPI: 41.5% vs 17.3%; RR=2.4 (95% CI 1.6 to 3.2) NNT=4.1 (95% CI 3.0 to 6.5)	SF-36 between group mean difference: Social functioning: 6.1 (95% CI -1.3 to 13.5) Vitality: 8.8 (95% CI 3.6 to 14.0) 50% or greater decrease in HSCL-20 from baseline: RR=2.3 (95% CI 1.5 to 3.2) GAD-7 between group mean difference: -2.2 (95% CI -3.5 to -0.9) Mean months of opioid use within 12 month period: 3.5 vs 3.0, p=0.35	NR

Author Year N Study Design Setting Follow-up	**Patient Characteristics** (1) % male (2) mean age (3) % white	**Pain Characteristics** (1) Most common location (% patients) (2) Mean duration (y) (3) Pain intensity (mean score on 10-pt scale) (4) % taking opioid	**Current Comorbidities** (1) MDD (2) Anxiety (3) PTSD (4) SUD (5) Medical	**Clinically significant* improvement in: Pain Intensity or Pain-related Function (Intervention vs Control)**	**QOL Depression Anxiety Sleep Opioid Dose (Intervention vs Control)**	**Unintended Consequences (Intervention vs Control)**
Kroenke 2014[10] 250 RCT VA 12 months	(1) 83% male (2) 55 years (3) 77% white	(1) NR (2) NR (3) 5.1 (BPI) (4) 34%	(1) 24% (2) 5.9 (GAD-7) (3) 17% (4) NR (5) 2.1 (mean # comorbid medical disease)	BPI: 51.7% vs 27.1%; RR=1.9 (95% CI 1.4 to 2.7) NNT=4.1 (95% CI 3.0 to 6.4)	SF-12 between group difference: Physical: 2.5 (0.0 to 5.0) Mental: 0.2 (-2.9 to 3.3) SF-36 between group difference: Social functioning: 5.3 (-1.6 to 12.2) Vitality: 2.2 (-3.9 to 8.2) PHQ-9 between group difference: -1.8 (-3.4 to -0.2) GAD-7 between group difference: -0.7 (-1.9 to 0.5) PROMIS sleep between group difference: -1.0 (-2.0 to 0.0) Mean # of months taking opioids: 2.0 vs 1.6, p=0.27	

Abbreviations: NR= not reported; y= years; MDD= major depressive disorder; SUD= substance use disorder; RMDQ= Roland Morris Disability Questionnaire; NNT= number needed to treat; SF-12= 12 item short form survey; HADS= Hospital Anxiety and Depression Scale; GAD-7= Generalized Anxiety Disorder scale-7; BPI= Brief Pain Inventory; SF-36= 36 item short form survey; HSCL-20= 20 item Hopkins Symptom Checklist; PROMIS= Patient Reported Outcomes Measurement Information System

[a] Determined using the Posttraumatic Stress Disorder Check List–17.Scores range from 0 to 68

[b] Determined using Patient Health Questionnaire–9.37 Scores range from 0 to 27,

[c] Determined using the Generalized Anxiety Disorder scale. Scores range from 0 to 21.

Data Abstraction: Intervention Characteristics

	Ahles 2001/ 2006[1,2]	Angeles 2013[3]	Bair 2015[4]	Burnham 2010[5]	Dobscha 2009[6]	Hay 2006[7]	Hill 2011[8]	Kroenke 2009[9]	Kroenke 2014[10]
Main components	Self-management Dartmouth COOP Clinical Improvement System (DCCIS) "computer-based algorithm" and a telephone-based, nurse educator intervention	Small group sessions covering education about chronic pain management, medication management, and physical activation techniques	Stepped care with analgesics, self-management and CBT delivered by 2 NCM	Multi-disciplinary approach: initial assessment, medication assessment, and supervised medication management or full multi-disciplinary program management	Collaborative approach: "Assistance with Pain Treatment" (APT) – clinician education, efficient delivery of necessary support to optimize guideline-concordant care and activate patients	Enhanced pharmacy review: pharmacy management in accordance with an algorithm	Stratified care model: Prognostic screening with STarT Back Screening Tool, matched treatment pathways	Stepped care with antidepressant and self-management delivered by a nurse case manager (NCM)	Automated symptom monitoring (ASM) and optimized analgesic management by NCM and MD pain specialist team
Case management team	Primary care clinician and nurse educator	Occupational therapist and social worker	2 nurse case managers (NCM)	Family physician, physiatrist, psychologist, physical therapist, kinesiologist, nurse, and dietician	Full-time psychologist care manager and internist	Community pharmacist; study nurse	Physio-therapist	NCM and MD depression specialist	NCM and MD pain specialist
Case management team training		Yes		Some had prior experience	Limited			Yes	Yes

	Ahles 2001/ 2006[1,2]	Angeles 2013[3]	Bair 2015[4]	Burnham 2010[5]	Dobscha 2009[6]	Hay 2006[7]	Hill 2011[8]	Kroenke 2009[9]	Kroenke 2014[10]
Patient contact with case management team	1-5 telephone calls over 1 week to 3 months	Weekly 2-hour group sessions for 8 weeks	Biweekly telephone for a total of 12	Low Risk Group: Initial assessment and ongoing care by primary care clinician High Risk Group: weekly 5-hour group sessions and one-on-one meetings with other CAPRI staff	Every 2 months after initial assessment	3 to 6 20-minute sessions with pharmacist	Initial assessment; follow-up physiotherapy	≥ 13 scheduled contacts (in-person and telephone)	1 in-person meeting and at 1 and 3 months; all others ASM-prompted
Case management meetings	Nurse-educator provided rapid feedback to PCP regarding patient treatment plan	Discussions with clinicians about pain management, education, self-management. During specific sessions, clinicians were involved as resource persons.	Weekly between physician investigators, supervising psychologist					Weekly	Weekly

	Ahles 2001/ 2006[1,2]	Angeles 2013[3]	Bair 2015[4]	Burnham 2010[5]	Dobscha 2009[6]	Hay 2006[7]	Hill 2011[8]	Kroenke 2009[9]	Kroenke 2014[10]
Stepped care protocol	Algorithmic rapid problem assessment and feedback to patients and practitioners, nurse educator intervention		Algorithmic analgesic optimization, then CBT	In some cases, patients were moved to more intensive treatment groups	Possible elements: APT internist consultation, individual mental health or SUD treatment consultation, additional care manager telephone contacts, or referral to the specialty pain clinic, orthopedics, or neurosurgery for evaluation for a procedural approach	Analgesic optimization algorithm			
Physician education, activation	Physicians sent patient flow sheet with information about patients "prescription" letter based on DCCIS questionnaire				2 90-minute sessions; ongoing feedback and recommend-dations from case management team		Single clinic session, physiotherapy (physical) sessions; physiotherapy (physical and psychological) sessions	Antidepressant optimization algorithm	Analgesic optimization algorithm

	Ahles 2001/ 2006[1,2]	Angeles 2013[3]	Bair 2015[4]	Burnham 2010[5]	Dobscha 2009[6]	Hay 2006[7]	Hill 2011[8]	Kroenke 2009[9]	Kroenke 2014[10]
Patient self-management support, activation, education	Based on responses to DCCIS questionnaire, patients were mailed a "prescription" letter referring them to specific pages of self-care educational information	Small group sessions	Patients provided menu of strategies using standardized protocol	Low Risk Group: ongoing care by primary care clinician High Risk Group: developed comprehensive problem and goal list, treatment plan, and weekly group education	Mailed written educational materials and encouraged to attend 4-session group workshop	3 to 6 20-minute sessions with pharmacist	Educational video and book	6 30-minute sessions with NCM using standard protocol	Written guide of self-management and other pain-related web-based and local resources
Psychological treatments	Weekly, individual nurse education sessions delivered by phone		6 biweekly, individual CBT sessions delivered by phone; referral to mental health practitioner as needed	Low Risk Group: N/A High Risk Group: weekly 1-hour psychotherapy session			High risk patients receive "psychologically informed physiotherapy"		
Health information technology									Telehealth modality via interactive voice response (IVR) or internet

	Ahles 2001/ 2006[1,2]	Angeles 2013[3]	Bair 2015[4]	Burnham 2010[5]	Dobscha 2009[6]	Hay 2006[7]	Hill 2011[8]	Kroenke 2009[9]	Kroenke 2014[10]
Ongoing monitoring	Weekly phone contacts unless patients reported a significant (less than level 3) improvement in pain	Weekly group sessions, post-intervention interview, 6-month follow-up assessment	Biweekly phone contacts; 12 during trial	Low Risk Group: primary care physician management until the pain is deemed satisfactorily controlled and stable High Risk Group: weekly group sessions and one-on-one	Every 2 months after initial assessment			≥ 13 scheduled contacts (in-person and telephone)	Automated using 15-item measure; weekly for first month, biweekly for months 2 and 3, monthly for months 4 to 12
Processes for ensuring treatment fidelity			Training, observation, audiotaping, feedback					Training, observation of first 5 subjects, weekly case management conferences, completion of a checklist for each session	
Role of PCP		Session topic suggestions		Low Risk Group: medication/ pain management High Risk Group: weekly group sessions and one-on-one meetings					Partnership per Three-Component Model

	Ahles 2001/ 2006[1,2]	Angeles 2013[3]	Bair 2015[4]	Burnham 2010[5]	Dobscha 2009[6]	Hay 2006[7]	Hill 2011[8]	Kroenke 2009[9]	Kroenke 2014[10]
Role of pharmacist			Overseeing dispensing			Monitor patients and optimize analgesics			
Incorporation of patients' goals/ preferences	Nurse educator established patient preferences for types of pain management strategies			Low Risk Group: No High Risk Group: Yes		Analgesic algorithm took into account patient preferences		Selection of self-management strategies	Choice of phone or internet for automated monitoring
Coordination of specialty care				Yes, team members included multiple specialties					
Patient stratification-guided care				Yes, complexity was a factor in determining treatment group					Assessment of opioid-prescribing risk

QUALITY ASSESSMENT OF INCLUDED PRIMARY STUDIES

Quality Assessment of RCTs

Author Year Country	Randomization adequate?	Allocation concealment adequate?	Groups similar at baseline?	Outcome assessors masked?	Care provider/ patient masked?	Intention-to-treat (ITT) analysis?	Acceptable levels of crossovers, adherence, and contamination?	Acceptable levels of overall attrition (≤ 20%) and between-group differences in attrition (≤ 10%)?	Quality rating (Good, Fair, Poor)
Ahles 2001[1] USA	Unclear; Insufficient detail to determine	Unclear; Insufficient detail to determine	No; More women (69% vs 53%) in the intervention group. More patients with emotional distress (33% vs 20%) and fair to poor health (35% vs 20%) in control group.	No; Patients acted as outcome assessors	No	No; Only patients who completed the follow-up questionnaire were analyzed	Unclear; Crossover: NR Adherence: NR Contamination: NR	No; 47% of patients failed to respond to the final questionnaire	Poor

Author Year Country	Randomization adequate?	Allocation concealment adequate?	Groups similar at baseline?	Outcome assessors masked?	Care provider/ patient masked?	Intention-to-treat (ITT) analysis?	Acceptable levels of crossovers, adherence, and contamination?	Acceptable levels of overall attrition (≤ 20%) and between-group differences in attrition (≤ 10%)?	Quality rating (Good, Fair, Poor)
Ahles 2006[2] USA	Unclear; random numbers printed on the baseline assessment forms, followed by computer-based assignment	Unclear; random numbers printed on the baseline assessment forms, followed by computer-based assignment	Unclear; More serious obesity (17% vs 10%) in the usual care group of cohort 1. More patients with SUD and pain for ≤3 yrs distress in the control group and intervention group, respectively, of cohort 2.	No; Patients acted as outcome assessors	No	No; Only patients who completed the follow-up questionnaire were analyzed	Unclear; Crossover: NR Adherence: NR Contamination: NR	Yes; Cohort 1: Attrition was 12%-16% Unclear; Cohort 2: Attrition was 23%- 29%	Fair

Author Year Country	Randomization adequate?	Allocation concealment adequate?	Groups similar at baseline?	Outcome assessors masked?	Care provider/ patient masked?	Intention-to-treat (ITT) analysis?	Acceptable levels of crossovers, adherence, and contamination?	Acceptable levels of overall attrition (≤ 20%) and between-group differences in attrition (≤ 10%)?	Quality rating (Good, Fair, Poor)
Angeles 2013[3] Canada	Yes	Unclear Insufficient detail to determine	Unclear; Mean age not given, more patients in early intervention group unemployed before pain onset and on government compensation after pain onset	Unclear; Unclear who acted as outcome assessors	No	No	Yes; Crossover: 2 subjects crossed over Adherence: Patients included in the analysis attended 6 or more of the 8 sessions Contamination: NR	No; In the early intervention group 34% dropped out, and in the late intervention group 35% dropped out	Poor
Bair 2015[4] USA	Yes; Computer generated	Yes; Concealed opaque envelopes	Yes	Yes; Research assistants blinded to treatment group	No	Yes	Unclear; Crossovers: NR Adherence: mean 9.2/12 sessions Contamination: NR	Yes; 95% at 9 months usual care, 89% at 9 months intervention	Good
Dobscha 2009[6] USA	Yes; SAS generated randomization	Yes; Independent statistician	Yes	Yes; Research assistant blinded	No	Yes	Unclear; Crossover: NR Adherence: 40-98% Contamination: NR	Yes	Good

Author Year Country	Randomization adequate?	Allocation concealment adequate?	Groups similar at baseline?	Outcome assessors masked?	Care provider/ patient masked?	Intention-to-treat (ITT) analysis?	Acceptable levels of crossovers, adherence, and contamination?	Acceptable levels of overall attrition (≤ 20%) and between-group differences in attrition (≤ 10%)?	Quality rating (Good, Fair, Poor)
Hay 2006[7] England	Yes; Computer generated	Yes; Sealed opaque envelope. Assessed treatment concealment and found it to be effective - 4% revealed.	Unclear; Less obese in physiotherapy group than in control (26% vs 41%)	Yes; Study nurses and researchers blinded	No	Unclear; Stated ITT analysis but not all analyzed that were randomized	Unclear; Crossovers: NR Adherence: 96% in pharmacy arm attended 3 or more sessions Contamination: some differences in co-interventions among groups	Yes; 83.3% control, 91.7% pharm, 89% phys at 12 months	Fair
Hill 2011[8] England	Yes; Computer generated	Yes; Remote randomization unit	Yes; Differential rate of "routine and manual occupations" in high-risk group (57% vs 73%)	Yes	No	Yes	Unclear; Crossovers: NR Adherence: 93% initial attendance Contamination: NR	Unclear; 77% intervention, 74% control at 12 months. Differential follow-up in high-risk groups at 12 months (82% vs 71%)	Fair

Author Year Country	Randomization adequate?	Allocation concealment adequate?	Groups similar at baseline?	Outcome assessors masked?	Care provider/ patient masked?	Intention-to-treat (ITT) analysis?	Acceptable levels of crossovers, adherence, and contamination?	Acceptable levels of overall attrition (≤ 20%) and between-group differences in attrition (≤ 10%)?	Quality rating (Good, Fair, Poor)
Kroenke 2009[9] USA	Yes; Computer generated	Yes; Concealed opaque envelopes	Yes; More patients in intervention group taking anti-depressants	Yes; Research assistants blinded to treatment group	No	Yes	Unclear; Crossovers: NR Adherence: mean 2.5/5 in-person contacts, mean 11.5/8 telephone contacts Contamination: Yes, describe patient-reported co-interventions	Yes; 83% at 12 months intervention, 81% at 12 months usual care	Good
Kroenke 2014[10] USA	Yes; Computer generated	Yes; Computer-generated list with varying block sizes, carried out by an independent project manager that wasn't involved with assessment	Yes	Yes; Research assistants blinded to treatment group	No	Yes; Only 1 excluded from primary analysis	Unclear; Crossovers: NR Adherence: Unclear - mean 12.7 nurse telephone contacts and mean 13.5 ASM contacts Contamination: reported on co-interventions	Yes; 97% at 12 months usual care, 94% at 12 months intervention	Good

Abbreviations: NR= not reported; SUD= substance use disorder; ITT= intention to treat; pharm= pharmacy; phys= physiotherapy; ASM= automated symptom monitoring

Quality Assessment of Observational Studies

Author Year	Risk of selection bias? (Yes, No, Unclear)	Risk of performance bias? (Yes, No, Unclear)	Risk of detection bias? (Yes, No, Unclear)	Risk of bias due to confounding (Yes, No, Unclear)	Risk of attrition bias? (Yes, No, Unclear)	Risk of reporting bias? (Yes, No, Unclear)	Overall risk of bias (High, Medium, low)
Burnham 2010[5]	Unclear;	Unclear;	Unclear;	Unclear;	Unclear;	No	Poor
Canada	Unclear how patients were accepted as referrals	No description of co-interventions or intervention fidelity	Outcome assessors not blinded, pain intensity quantified not using standardized scale	Groups different at baseline in education level and depression; no adjustment for confounders	Low but differential overall loss to follow-up (0% med management vs 13% multi management)		

STRENGTH OF EVIDENCE FOR INCLUDED STUDIES

Strength of Evidence for Improvement in Pain Intensity and Pain-related Function

SOE Grade	Study, Design (N)	Study Limitations*	Consistency	Precision**	Findings
Low	Ahles 2001,[1] 2006,[2] RCT (1066)	Medium	Unknown	Precise†	No significant difference in changes in bodily pain scores (SF-36).
Insufficient	Angeles 2013,[3] RCT (63)	High	Unknown	Imprecise†	Improved bodily pain score (SF-36): mean difference 13.1, P<0.05
Low	Bair 2015,[4] RCT (241)	Low	Unknown	Imprecise	Improved pain scores with intervention: RMDQ: 44% vs 32%; RR=1.52 (95% CI 1.22 to 1.99)
Insufficient	Burnham 2010,[5] Cohort (82)	High	Unknown	Imprecise†	No significant difference in pain improvement between supervised medication management and full program.
Low	Dobscha 2009,[6] RCT (401)	Low	Unknown	Imprecise	Improved pain scores with intervention: RMDQ: 21.9% vs 14.0%, P=0.04
Low	Hay 2006,[7] RCT (216)	Medium	Unknown	Imprecise	No significant difference in changes in OMERACT-OARSI (high improvement).
Low	Hill 2011,[8] RCT (851)	Medium	Unknown	Imprecise	Improved pain scores with intervention: RMDQ: 65% vs 57%; OR=1.48 (95% CI 1.02 to 2.15)
Moderate	Kroenke 2009,[9] RCT (250)	Low	Unknown	Precise	Improved pain scores with intervention: BPI: 41.5% vs 17.3%; RR=2.4 (95% CI 1.6 to 3.2)
Moderate	Kroenke 2014,[10] RCT (250)	Low	Unknown	Precise	Improved pain scores with intervention: BPI: 51.7% vs 27.1%; RR=1.9 (95% CI 1.4 to 2.7)

*High, medium, low based on study quality
**OIS for ≥ 30% improvement in pain intensity/ related function outcome
†Precision based on other reported pain outcome when primary outcome not reported
Abbreviations: SF-36= 36 item short form survey; RMDQ=Roland-Morris Disability Questionnaire; RR= relative risk;; OMERACT-OARSI=Outcome measures in rheumatology-Osteoarthritis Research Society International; BPI=Brief pain inventory

APPENDIX D: EMERGING MODELS

SINGLE-ARM BEFORE-AFTER STUDIES

Author, Year	N	Setting	Intervention	Follow-Up	Findings
Briggs, 2008[11]	65	England	Managed care with nurse and pharmacist	6 months	Improved pain score (0-10 scale) : 8 vs 6.3, p<0.001
Chelminski, 2005[12]	63	University Medical Center, US	Case management with PCP, pharmacists, and psychiatrist: structured clinical assessments, monthly follow-up, pain contracts, medication titration, and psychiatric consultation	3 months	Improved pain score (0-10 scale): 6.5 vs 5.5, p=0.003
Dorflinger, 2014[13]	NR	VA	Collaborative care with multidisciplinary team including PCPs, specialists, support	12 month cohorts	No difference in pain severity rating
Gardiner, 2014[14]	65	Boston Medical Center	Integrative medical group visit care model: clinician facilitated group visits, self-care, one-on-one meetings with PCP	8 weeks	Improved pain score: mean reduction in score=0.7, p=0.005
Unutzer, 2008[15]	14	University Medical Center, US	Care management with nurse and PCP	6 months	Improved pain score (0-10 scale): 5.67 vs 4.18, p=0.021
Wiedemer, 2007[16]	335	VA	Opioid Renewal Clinic: Managed Care with PCP, pharmacists, multi-specialty pain team	18 months	Improved opioid use behaviors.

Abbreviations: PCP=Primary care provider

PENDING FINDINGS

Principal Investigator(s); Setting	Intervention	Study Design	Status	Information Resources (NCT or other registry #; citation(s) for published protocols; links to project websites)
Enric Aragones, MD, PhD; primary care centers in Tarragona, Spain	Care management, optimized antidepressant treatment and psychoeducational group	RCT	Recruiting participants	NCT02605278 Aragonès E, López-Cortacans G, Caballero A, et al. Evaluation of a multicomponent programme for the management of musculoskeletal pain and depression in primary care: a cluster-randomised clinical trial (the DROP study). *BMC psychiatry*. 2016;16(1):1.
Matthew Bair, MD, MS; Indianapolis VA	CAre Management for the Effective use of Opioids (CAMEO): Algorithm-based co-analgesic treatment or self-management	RCT	Analysis phase; no published data.	VA HSR&D Project #IIR 10-128 http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141700805
Dan Cherkin, PhD; primary care clinics in WA state	STarT Back Tool risk stratification	RCT	Recruiting participants.	NCT02286141 Cherkin D, Balderson B, Brewer G, et al. Evaluation of a risk-stratification strategy to improve primary care for low back pain: the MATCH cluster randomized trial protocol. *BMC Musculoskeletal Disorders*. 2016;17(1):361.
Maud-Christine Chouinard, PhD, Catherine Hudon, PhD; primary care practices in Quebec, Canada	Nurse case management and self-management support in primary care	RCT	Completed. Qualitative experiences and baseline characteristics published. No studies on pain outcomes published. Author contacted.	NCT01719991 Chouinard M-C, Hudon C, Dubois M-F, et al. Case management and self-management support for frequent users with chronic disease in primary care: a pragmatic randomized controlled trial. *BMC Health Services Research.* 2013;13:49.
Lynn DeBar, PhD; Kaiser Permanente GA, HI, and Northwest regions	Pain Program for Active Coping and Training (PPACT): Collaborative care with multidisciplinary team to integrate psychosocial services into primary care	RCT	Ongoing. Project end date: 02/28/2018	https://projectreporter.nih.gov/project_info_description.cfm?aid=9348731&icde=31747148
Eric de Heer; primary care practices in Netherlands	Collaborative care with care-manager, psychiatrist and physiotherapist with or without duloxetine	RCT	Abstract of preliminary results published. Full results to be published early 2017.	NTR1089 de Heer E, de Wilde-Timmerman L, Dekker J, et al. Efficacy of Collaborative Care versus antidepressant treatment in chronic pain and major depression: a multi-center proof of concept study. *Journal of Psychosomatic Research*. 2016;85:60-61.

Principal Investigator(s); Setting	Intervention	Study Design	Status	Information Resources (NCT or other registry #; citation(s) for published protocols; links to project websites)
Linda Eaton; rural community health providers in WA, WY, AK, MT, ID	Telehealth-enhanced symptom management with community health care providers and case managers	RCT	Currently in analysis phase; no published data.	Eaton LH, Gordon DB, Wyant S, et al. Development and implementation of a telehealth-enhanced intervention for pain and symptom management. *Contemporary clinical trials*. Jul 2014;38(2):213-220.
Christine Goertz, DC, PhD; community-based centers in IA, IL	Collaborative care between primary care and chiropractic care	RCT	Results to be published early 2017.	NCT01312233 Goertz CM, Salsbury SA, Vining RD, et al. Collaborative Care for Older Adults with low back pain by family medicine physicians and doctors of chiropractic (COCOA): study protocol for a randomized controlled trial. Trials [Electronic Resource]. 2013;14:18.
Jordan F. Karp, MD; University of Pittsburgh primary care	Stepped care with venlafaxine, supportive management, and problem-solving therapy	RCT	Phase I data published. Full evaluation of stepped care model to be published early 2017.	NCT01124188 Karp JF, Rollman BL, Reynolds CF, 3rd, et al. Addressing both depression and pain in late life: the methodology of the ADAPT study. *Pain Medicine*. Mar 2012;13(3):405-418.
Erin Krebs, MD, MPH; VA National	Telecare collaborative management or integrated pain team management	Controlled trial	Contract pending.	https://wwwcf.nlm.nih.gov/hsr_project/view_hsrproj_record.cfm?NLMUNIQUE_ID=20164146
Peter MacDougal, PhD, MD, FRCPC; primary care in Nova Scotia	Nova Scotia Chronic Pain Care Collaborative Care Network: Chronic pain and addiction specialists serving as mentors to primary care providers.	RandomizedSingle group assignment	Completed. Posters and abstracts published. In contact with author to receive publications.	NCT00909493

APPENDIX E: PEER REVIEW

Comment #	Reviewer #	Comment	*Author Response*
Are the objectives, scope, and methods for this review clearly described?			
1	1	Yes	*None*
2	2	Yes	*None*
3	3	Yes	*None*
4	4	Yes	*None*
Is there any indication of bias in our synthesis of the evidence?			
9	1	No	*None*
10	2	No	*None*
11	3	No	*None*
12	4	No	*None*
Are there any published or unpublished studies that we may have overlooked?			
13	1	Yes - It is possible that some relevant studies were missed. For example, the following article comes to mind. Why was this missed in the search, and if it was located, why was it excluded? Lamb SE1, Hansen Z, Lall R, Castelnuovo E, Withers EJ, Nichols V, Potter R, Underwood MR; Back Skills Training Trial investigators. Group cognitive behavioural treatment for low-back pain in primary care: a randomised controlled trial and cost-effectiveness analysis. Lancet. 2010 Mar 13;375(9718):916-23. doi: 10.1016/S0140-6736(09)62164-4. Epub 2010 Feb 25.	Yes, our search missed this study because its indexing lacked terms for health care delivery or management. Upon review, we excluded this study because it focused only on CBT and lacked any system-level strategies for improving multimodal care delivery overall.
14	2	No	*None*
15	3	No	*None*
16	4	No	*None*
Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.			

17	1	I am a little concerned that the search was largely limited to Medline and CINAHL. What about PsychINFO, CENTRAL and EMBASE?	We always search MEDLINE because of its broad subject coverage. For subject-specific databases, we additionally specifically chose CINAHL because of this review's focus on models of care involving collaboration, management, and integration with nursing and allied health professions. Although we recognize that pain is a complex condition often involving dynamic interactions with behavioral and mental health factors, we did not search PsycINFO because we did not anticipate the additional psychological-focused sources to add key literature not already identified through MEDLINE and CINAHL. Likewise, because of the overlap between MEDLINE, CENTRAL and EMBASE, we judged there to be a low risk of missing key unique literature through exclusion of CENTRAL and EMBASE that we would not find through extensive searching of reference lists, asking our Operational Partners, peer reviewers and other experts, and searching other sources.
18	1	Although I appreciate the focus on examining care delivered in primary care settings, this focus may be unnecessarily limited, since a large historical literature has focused on examination of the effectiveness of multidisciplinary pain clinics or centers, and these reports may have at lesat some relevance in the context of the current review.	Added to Discussion: *"At the advice of our Operational Partners, we focused on primary care because it is responsible for the majority of pain management. However, we acknowledge this limits the applicability of the findings of our review to a broader range of specialty settings, including multidisciplinary pain clinics, rehabilitation centers, etc."*
19	1	All acronyms should be defined (e.g., NR, on page 3 in the Executive Summary)	Added acronyms
20	1	A very recent published paper could be cited: Nahin RL, Severe Pain in Veterans: The Impact of Age and Sex, and Comparisons to the General Population, Journal of Pain (2016), doi: 10.1016/j.jpain.2016.10.021.	Thank you. Added to Background: "*Prevalence of severe pain is more common in veterans than in the general population.*[22]"
21	1	Multimodal pain care can include non-opioid pharmacological approaches	Agreed, we already have "pharmacological" treatment in our Background list of potential multimodal pain care options.
22	1	I'm not sure about some assertions, such as the statement that most participants in the studies cited were older. Also, the IOM estimate of 116 million persons with chronic pain was revised to 100 million.	Removed "older" from list of complicating factors listed in the Background. Revised IOM estimate as suggested.
23	2	Please make sure that you define all abbreviations and acronyms in the tables. Some are missing. Also, please review the References list as there are some duplicates..	Added definitions of abbreviations and acronyms and removed duplicate references.

24	3	Page 24, lines 18-24. Regards to primary care clinicians experience with multimodal models of chronic pain management, there is some VA data about these programs, likely through process improvement processes. I am uncertain about the accessibility of such data or the quality. Potential references for this data are Ilene Robeck, Nancy Wiedemer, and Stephen Mudra.	Thank you for these suggestions. We are aware of Dr. Wiedemer's work in improving opioid use through her Opioid Renewal Clinic. We included findings from her 2007 single-arm study in Appendix D. *Wiedemer NL, Harden PS, Arndt IO, Gallagher RM. The opioid renewal clinic: a primary care, managed approach to opioid therapy in chronic pain patients at risk for substance abuse. Pain Medicine. 2007;8(7):573-584* . Contact with Drs. Robeck and Mudra did not result in identification of any additional data.
25	4	1. Executive summary (page 2) -- define or include some parenthetical information to clarify "small-study."	Changed to "…a single study with imprecise findings. We previously used "small" to describe when findings were imprecise due to an insufficiently powered evidence base. To assess precision of remission rates, we used an online calculator to determine the sample size needed for 80% power with a 5% two-tailed significance level (https://www.stat.ubc.ca/~rollin/stats/ssize/b2.html)
26	4	2. Background (page 4): The IOM report was revised; from 116 million to 100 million estimate	Revised.
27	4	3. Background (page 4): Should read 31% (not 31 percent)	Changed as suggested.
28	4	4. Methods (page 7): It might help this reader/reviewer to define "grey literature."	We removed the term grey literature and instead listed all the sources.
29	4	5. Study design and quality (page 9): Clarification of what "moderate levels of attrition" means would help. "Small study" is mentioned again.	Changed sentence on page 9 to: *"Common limitations among fair-quality studies included greater than 20% attrition…"* On page 10, changed sentence to: "…a single study with imprecise findings."
30	4	6. Risk of bias...(page 10): What is considered an acceptable level of attrition?	We generally consider attrition of ≤ 20% as acceptable. This is consistent with RCTs' typical approach of calculating power to reasonably expect 20% attrition. Added these thresholds to Quality Assessment table.
31	4	7. The Roudebush VAMC is mentioned several times. Could include Indianapolis in parenthesis or simply refer as Indianapolis VAMC to be consistent with mention of Portland VAMC.	Changed to Indianapolis VAMC
32	4	8. Table 1: in Bair, ESCAPE study: Mean (SD) depressive and PTSD symptoms were listed in Table 2	Added
33	4	9. Key multimodal chronic pain care model processes (page 13): The sentence "All but two models included components to multiple states of the process" required me to read a few times. Hoping it could be clarified some.	Changed to: "*All but two models[2,7] involved multiple processes for improving pain care delivery*"
34	4	10. Model components...(page 15): I'm not clear on the meaning of "fixed" in 57% of the models.	Changed to 'required'.

35	4	11. Table 3 (page 16): What dose "fixed CBT" mean?	Changed to 'required' vs optional/as-needed.
36	4	12. Table 3 (page 16): int 1 and int 2 are not intuitive. Either spell out or consider other term(s), e.g. study arm 1, study arm	Changed as suggested.
37	4	13. Patient outcomes (page 18): The phrase "statistically significantly increased in…" is awkward. Could simply say: statistically significant.	Changed to *"…was significantly increased…"*
38	4	14. Table 4 (page 19): For the Kroenke (SCAMP) trial what are the units for amount of opioid use during the intervention (3.5 vs 3.0)?	Added unit, which was mean number of months within 12 month period.
39	4	15. Summary and Discussion (Page 22): provide some parenthetical information that specifies what is meant by "small study."	We used "small" to describe when findings were imprecise due to an insufficiently powered evidence base. To assess precision of remission rates, we used an online calculator to determine the sample size needed for 80% power with a 5% two-tailed significance level (https://www.stat.ubc.ca/~rollin/stats/ssize/b2.html)
40	4	16. Should consider including Indianapolis in parentheses when referring to Roudebush VAMC or simply refer as Indianapolis VAMC.	Changed to "Indianapolis VAMC"
41	4	17. References: #3 and #20 are repeats	Deleted duplicate #20
42	4	18. Grey literature searching?	Changed title of search results table in Supplemental materials to "Additional sources searched"
43	4	19. Appendix C: Depression and PTSD symptoms (mean and SD) are reported in Table 2 of ESCAPE	Added.
44	4	20. Appendix C: Anxiety symptoms are reported in Table 4 of SCAMP	Added
45	4	21. Appendix C: What are the units for "amount of opioid use" in SCAMP?	Added unit, which was mean number of months within 12 month period.
46	4	22. Curious why the Hill 2011 trial is rated as fair? With such a large trial across UK practices, I might expect a little greater attrition than single-site trials.	Yes, at 24%, its attrition was higher than in other 12 months studies (range, 3% to 19%); even than in another multicenter study of 15 sites in England (16%) . But it is a minor flaw that is not likely to cause major bias – which is reflected by the fair quality rating.
47	5	Page 8, line 7: need a "." After management	Added
48	5	Page 26, line 14-15: "PROMIS: Your might consider this reference: Cook, Karon F., et al. "Leveraging PROMIS measures to build and pilot the DoD's Pain Assessment Screening Tool and Registry (PASTOR)." QUALITY OF LIFE RESEARCH. Vol. 24. VAN GODEWIJCKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS: SPRINGER, 2015.	Added

49	5	Page 26, line 17-18: DVPRS: Consider these references: Buckenmaier, Chester C., et al. "Preliminary validation of the Defense and Veterans Pain Rating Scale (DVPRS) in a military population." Pain Medicine 14.1 (2013): 110-123. Polomano, Rosemary C., et al. "Psychometric Testing of the Defense and Veterans Pain Rating Scale (DVPRS): A New Pain Scale for Military Population." Pain Medicine (2016): pnw105.	Added
50	5	Page 26, line 56-59 Since you mention PROMIS, PEG, and the DVPRS, would it also be prudent to recommend utilization of these new standards for capturing information on the impact of pain on other key functional domains? These tools were developed with an understanding of the value of collecting information consistently using established functional domains. Because of computer adaptive testing and the modern Internet, collection of information on a wide range of pain related functional domains is feasible. PASTOR, which leverages both PROMIS and the DVPRS, can be completed in less than 20 minutes and provides information on pain intensity (DVPRS) and depression, anxiety, anger, physical function, social function, pain interference, sleep disturbance, and fatigue (PROMIS). Recognizing the PASTOR effort that was developed collaboratively by the VA and DoD seems prudent.	Added: “Additionally, the Pain Assessment Screening Tool and Outcomes Registry (PASTOR) was developed and is being piloted collaboratively by the VA and Department of Defense to use computer adaptive testing and the internet to implement administration of PROMIS and DVPRS in a military health system’s electronic health record system.”

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