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MANAGEMENT OF CHRONIC PAIN IN RESOURCE-LIMITED SETTINGS: A LITERATURE REVIEW OF EFFECTIVENESS, SAFETY, AND FEASIBILITY WITH AN EMPHASIS ON INDONESIA'S BPJS HEALTH COVERAGE

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Abstract

Chronic pain disproportionately affects rural populations, where limited specialist access constrains multimodal care. We synthesized evidence on the effectiveness, safety, and feasibility of interventions suited to resource-limited settings, with emphasis on Indonesia's BPJS context. Using a PICOS-based strategy, we searched PubMed, ScienceDirect, Cochrane, and ProQuest (2015–2025) and identified 13 studies (n=2,022) encompassing randomized trials, pragmatic cohorts, and feasibility pilots. Across settings, nonpharmacologic and multimodal approaches—peer-led self-management and group education, literacy-adapted cognitive-behavioral/digital coping programs, tele-enabled collaborative care, integrative medicine group visits, massage, exercise, and community or marine-based activity—consistently improved pain-related function and quality of life, often with reduced analgesic and opioid use. Evidence for pharmacologic-only approaches was limited. These findings support a stepped, non-drug-first model aligned with BPJS purchasing that prioritizes functional improvement and deprescribing. Evidence gaps—including limited data from low- and middle-income countries, heterogeneous endpoints, and short follow-up—justify pragmatic, hybrid effectiveness–implementation trials and claims-linked evaluations to confirm durability, equity, and cost-effectiveness and to guide scale-up in BPJS primary care.

Keywords: *chronic pain, rural-health, resource-limited, pain management*

INTRODUCTION

The International Association for the Study of Pain (IASP) defines pain as a multifaceted sensory and emotional experience that is associated with actual or potential tissue injury (Raja et al., 2020). Chronic pain is generally described as pain persisting beyond three months and is recognized as a condition that can significantly disrupt essential aspects of daily living, including occupational functioning, interpersonal relationships, and self-care activities (Zhu et al., 2024). The etiology of chronic pain is diverse, encompassing conditions such as malignancies, arthritis, and other rheumatologic disorders. Within this spectrum, musculoskeletal pain represents a major global health concern and has consistently been ranked among the five leading causes of disability-adjusted life years (DALYs) (Wu et al., 2020). Notably, low back pain has been identified as the predominant contributor to years lived with disability across all populations worldwide. Beyond its physical manifestations, chronic pain exerts a profound negative influence on overall quality of life and is strongly correlated with psychiatric comorbidities, including depression, cognitive decline, heightened risk of suicidal behavior, and substance dependence (Zis et al., 2017; Khalid et al., 2022).

Epidemiological evidence also demonstrates that the burden of chronic pain is unequally distributed across geographic populations. Individuals residing in rural communities exhibit higher prevalence rates compared to their urban counterparts. For instance, data from the 2018 Behavioral Risk Factor Surveillance System reported that 30.9% of rural adults experienced chronic pain, compared with 19.6% of adults in urban areas. Moreover, rural residents with chronic low back pain tend to report greater functional limitations and encounter reduced access to specialty services (Rikard, 2023). Several structural, socioeconomic, and behavioral determinants contribute to these disparities. Rural populations frequently contend with shortages in healthcare infrastructure and workforce, higher levels of poverty, and increased travel distances to medical facilities. In addition, these populations demonstrate greater prevalence of comorbid conditions and higher rates of health risk behaviors, such as tobacco use (Jensen et al., 2020). Management of chronic pain in rural contexts is typically concentrated within primary care settings, as access to multidisciplinary pain clinics remains limited. This reliance on primary care providers places considerable strain on the rural healthcare system and results in comparatively lower utilization of non-opioid pharmacotherapies and non-pharmacological interventions, further reinforcing inequities in pain care delivery and outcomes (Eaton et al., 2018).

In 2010, the Institute of Medicine reported that chronic pain affected roughly one-third of the U.S. population, with estimated economic losses between US$560 and US$635 billion annually, largely due to medical expenses and reduced productivity. In 2021, the economic costs of chronic pain in the United States were estimated to be $722.8 billion, including $530.6 billion in medical care costs and $192.2 billion in lost work productivity (Guy et al., 2021). More recent findings from Australia suggest that around 15.4% of Australians live with chronic pain, with the annual per-person cost, once both direct and indirect burdens are considered, ranging from AU$22,588 to AU$42,979 (Cohen et al., 2021).

Over the past decade, the Government of Indonesia has rolled out a new National Social Security System (Sistem Jaminan Sosial Nasional/SJSN). As part of this reform, the National Health Insurance Program (Jaminan Kesehatan Nasional/JKN) was introduced on January 1, 2014, with the Social Insurance Administration Organization – Health (Badan Penyelenggara Jaminan Sosial Kesehatan/BPJS-Kesehatan) (Yuniarti et al., 2019). The recent report shows that around 280 million (98%) Indonesians have been enrolled as participants (BPJS Kesehatan, 2025). The primary objective of JKN is to guarantee fair and equitable access to health services for the entire population, including communities living in remote regions and on distant islands. BPJS-Kesehatan reported that the cost of benefit in JKN had reached IDR 87,22 trillion in 2017 (Yuniarti et al., 2019). According to the 2023 BPJS financial report, the cost of benefits increased to IDR 151.7 trillion (BPJS Kesehatan, 2023). Chronic pain's economic costs must be quantified to give policymakers the evidence needed to allocate limited healthcare resources effectively.

METHODOLOGY

This literature review explored the management of chronic pain in rural and resource-limited settings, focusing on interventions, accessibility, and treatment outcomes. Literature searches were conducted in PubMed, ScienceDirect, Cochrane, and Proquest, using the main keywords "chronic pain," "pain management," and "rural settings." The search was restricted to studies published between 2015 and 2025. The initial search identified 439 articles from PubMed, 1,774 from ScienceDirect, 125 from Cochrane, and 516 from Proquest.. After filtering by year, title, and abstract, and removing duplicates, 8 PubMed, 2 ScienceDirect, and 2 Cochrane studies were included for review (Figure 1).

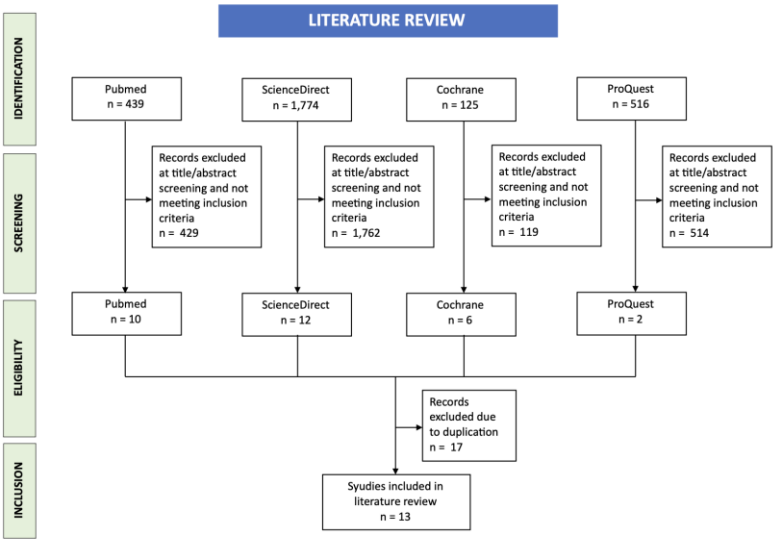

Figure 1. Flow diagram of literature review

Study selection followed the PICOS framework. The population of this study was individuals in rural or resource-limited settings with chronic pain. Interventions included pharmacological approaches (NSAIDs, opioids, adjuvant drugs) as well as non-pharmacological or multimodal strategies (rehabilitation, telemedicine, physical therapy, and complementary therapies). The primary outcomes were pain intensity, measured by validated

tools such as the Visual Analog Scale or Brief Pain Inventory, and functional disability, assessed using the Oswestry Disability Index or work interference scores. Secondary outcomes included reduction of medication use (opioid reduction and number of pain tablets) and feasibility factors (barriers, cost, accessibility).

RESULT AND DISCUSSION

Summary of main findings

This review identified 13 studies including 2,022 participants, conducted between 2015 and 2025, that examined both pharmacological and non-pharmacological interventions for chronic pain in rural and resource-limited settings. The majority of these investigations were randomized controlled trials or pragmatic cohort studies, complemented by feasibility pilots and community-based interventions, underscoring the growing methodological diversity in this field. However, the geographic distribution of evidence was uneven and most data were generated in high-income countries with rural subpopulations, particularly the United States, with additional contributions from Taiwan and South Korea, whereas studies from low- and middle-income countries were limited to selected sites in Nigeria.

Across contexts, the findings, summarized in Table 1, point to the value of integrating innovative, context-sensitive approaches that can be feasibly delivered in resource-constrained environments. Behavioral strategies, particularly peer-delivered and literacy-adapted cognitive behavioral therapy, enhanced self-efficacy and reduced pain and disability while providing scalable, non-pharmacological alternatives to opioid or NSAID use. Community-based programs, such as peer-led self-management workshops and integrative group visits, demonstrated feasibility and acceptability, reducing healthcare utilization while fostering social support. Telemedicine, through nurse-led collaborative care and automated internet-based coping platforms, improved access for geographically isolated populations and yielded benefits in pain control, functional outcomes, and substance use management, with strong potential for large-scale dissemination. Educational interventions, notably patient education combined with motor control exercise, were not only effective in improving pain and disability but also demonstrated cost-efficiency and addressed maladaptive pain beliefs more effectively than single interventions. Finally, integrative approaches, including massage and marine healing therapies, produced clinically meaningful improvements in pain relief, physical function, and quality of life, particularly among older adults and underserved groups. Collectively, these findings highlight that sustainable pain management in rural settings is best achieved through multimodal strategies that are adaptable, culturally relevant, and capable of reducing the burden of pain and opioid dependence while enhancing quality of life in vulnerable populations.

Table 1. Summary of Studies

Study	Recommendations
Behavioral strategies	
Khodneva et al, 2021	• Peer-delivered CBT is effective for rural, low-income patients with chronic pain + diabetes • Improves self-efficacy, reduces pain and disability • Scalable using community peer leaders

	• Non-pharmacological option that can reduce opioid/NSAID reliance
Thorn et al, 2018	- Literacy-adapted CBT is feasible and effective in low-income underserved patients with chronic pain - Provides greater benefit than education alone for pain, disability, and depression - Can be integrated into safety-net and rural clinics with group delivery to improve access
Chung-Ting Liu, 2020	Behavioral strategies were more commonly used and believed to be more beneficial than were cognitive strategies among the rural older adults in mountainous areas of Taiwan.
Community-based programmes	
Igwesi-Chidobe et al, 2019	• Community self-management programs are feasible, effective, and culturally acceptable • Important for reducing opioid dependence in rural Africa • Should be scaled up with adjustments for transport, stigma, and gender participation
Gardiner at al, 2019	- IMGV may be helpful in patients with chronic pain and depression. - The active interaction with the clinician at the IMGV may offer opportunities intervene on subacute issues prior to requiring an ED visit - Pain education, present in this intervention, can contribute to lower health-care utilization and may provide additional explanation for the reduction in ED visits
Madrona et al. 2016	• Approach grounded in the neurobiology of emotion and nociceptive perception and using CAM therapies in a group setting can reduce pain and medication use • Social relationships and the presence or absence of community has a strong influence on pain perception. • Increased awareness of one's emotions could facilitate pain management
Telemedicine	
Travis et al., 2025	- Telehealth widens its potential reach to patients who face geographic or other barriers to treatment engagement, such as those residing in rural areas. - Positive outcomes in pain reduction, function, and substance use management.
Rini et al, 2015	• Automated Internet-based PCST is feasible and effective for OA pain • Improves both pain and function, while boosting coping skills • Suitable for large-scale dissemination in areas with limited access • Future studies should test cost-effectiveness and long-term outcomes
Education programmes	
Stack et al 2020	Active patient education, attention to risk reduction, treatment of psychiatric comorbidities and attentive management of pain with nonmedication and nonopioid pain medicines, all contributed to patient retention and low mortality rates.
Ibrahim et al, 2023	• PE + MCE should be first-line in low-resource rural settings (greater improvements in pain, disability, and medication reduction) • MCE alone is cost-efficient for disability improvement, PE alone valuable for addressing maladaptive pain beliefs • Tailor interventions to resources and patient needs; consider combining strategies for best outcomes
Others	
Pullyblank et al, 2022	- The presence of depression and/or anxiety also impacted change in pain disability scores significantly - Essential elements of peer-facilitated pain self-management programs include the value of making interpersonal connections, facilitating the use of pain self-management strategies, and providing/receiving encouragement or support
Baek et al, 2025	• Marine healing programs can be an effective, integrative, non-pharmacological treatment for chronic low back pain • Incorporate natural environments, mindfulness, and physical therapy into management • Potential to reduce healthcare burden in older adults, especially in rural or underserved settings
Elder et al, 2017	- Meaningful signal of massage effectiveness for primary care patients with CLBP - Provide clinically significant improvements in pain, disability, and quality of life - Suggests that CLBP patients will access real-world massage treatment if recommended to do so by their PCP, at least under the conditions studied here, in which fee barriers were alleviated

CBT — Cognitive Behavioral Therapy, NSAID — Nonsteroidal Anti-Inflammatory Drugs, IMGV — Integrative Medicine Group Visits, ED — Emergency Department, CAM — Complementary and Alternative Medicine, PCST — Pain Coping Skills Training, OA — Osteoarthritis, PE — Patient Education, MCE — Motor Control Exercise, CPSMP — Chronic Pain Self-Management Program, CDSMP — Chronic Disease Self-Management Program, CLBP — Chronic Low Back Pain, PCP — Primary Care Provider, SUD — Substance Use Disorder, RCT — Randomized Controlled Trial

Table 2. Study characteristics and results

Author, Year	Study Design	Study Location	Study Group	Pain Score	Functional disability	Medication use	
						Opioid	Pain tablets
Chung-Ting Liu, 2020	Cross sectional study	Taiwan (mountainous rural areas, older adults)	- Pain experiences - Coping strategies	Average pain intensity Mild (VAS 1-3) : 14 (25.5%) Moderate (VAS 4-6) : 32 (58.2%) Severe (VAS 7-10) : 9 (16.4%) Worst pain intensity Mild (VAS 1-3) : 8 (14.5%) Moderate (VAS 4-6) : 17 (30.9%) Severe (VAS 7-10) : 30 (54.5%)	Independence of functional ability Dependence : WPI : Mild 11 (44.0%), Severe 14 (46.7%) API : Mild 19 (41.3%), Severe 6 (66.7%) Independece : WPI : Mild 14 (56.0%), Severe 16 (53.3%) API : Mild 26 (58.7%), Severe 3 (33.3%)	NI	NI
Baek et al, 2025	RCT	South Korea (Taean, Chungcheongnam-do)	- Marine healing program (MHP) - Core exercises (CE)	Resting pain (VAS) Baseline: MHP = 4.11 ± 1.75 CE = 3.89 ± 1.70 Post-test: MHP = 1.17 ± 1.45 CE = 3.40 ± 1.42	ODI (0-100) Baseline: MHP = 42.06 ± 12.61 CE = 43.67 ± 13.84 Post-test: MHP = 24.72 ± 9.81 CE = 40.72 ± 11.37	NI	NI
Ibrahim et al, 2023	RCT	Nigeria (rural Kano State, Northwestern Nigeria)	- Patient education + motor control exercise (PE + MCE) - Patient education (PE)	NPRS (0-10) Baseline: PE+MCE = 6.20 (1.71) PE = 6.25 (1.83) MCE = 5.80 (1.63) 8 weeks: PE+MCE = 3.08 (1.65) PE = 4.23 (1.70) MCE = 3.48 (1.73) 20 weeks: PE+MCE = 2.93 (1.62) PE = 4.18 (1.73) MCE = 3.33 (1.54)	ODI (0-100) Baseline: PE+MCE = 23.4 (12.5) PE = 25.2 (14.5) MCE = 23.8 (12.1) 8 weeks: PE+MCE = 13.7 (6.77) PE = 18.8 (10.7) MCE = 13.1 (7.21) 20 weeks: PE+MCE = 11.6 (5.12) PE =17.6 (9.99) MCE = 11.0 (5.58)	NI	Baseline: PE+MCE = 10.0 (8.14) PE = 9.10 (6.81) MCE = 11.2 (8.51) 8 weeks: PE+MCE = 5.05 (6.77) PE = 9.37 (7.68) MCE = 7.10 (7.00)
Igwesi-Chidobe et al, 2019	Non-RCT	Nigeria (rural Enugu State, Southeastern Nigeria)	- Self management group with Good Back Programme (GBP) - Usual care (UC)	11-BS Baseline: GBP = 6.8 (1.7) UC = 5.3 (1.6) Post-test:	RMDQ Baseline: GBP = 17.0 (5.8) UC = 17.8 (4.6) Post-test:	NI	Pain tablets in 2 weeks Baseline: GBP = 17.3 (14.0) UC = 28.2 (34.2)

				GBP = 2.8 (1.3) UC = 7.0 (2.5)	GBP = 7.0 (4.2) UC = 19.6 (5.6)		Post-test: GBP = 3.2 (5.0) UC = 28.5 (37.8
Thorn et al, 2018	RCT	United States (Alabama, low-income community clinics)	- Usual care (UC) - Cognitive behavioral therapy (CBT) - CBT + pain education (EDU)	BPI-Intensity score Baseline to Posttreatment: UC = –0.26 (–0.61 to 0.08) CBT = –1.06 (–1.65 to –0.47) EDU = –0.83 (–1.14 to –0.41) 6-Month Follow-up: UC = –0.24 (–0.60 to 0.11) CBT = 0.35 (–0.05 to 0.76) EDU = 0.14 (–0.20 to 0.59)	BPI-Interference score Baseline to Posttreatment: UC =–0.30 (–0.77 to 0.17) CBT = –1.66 (–2.24 to –1.07) EDU = –1.00 (–1.39 to –0.62) 6-Month Follow-up: UC = 0.18 (–0.25 to 0.62) CBT = 0.54 (0.09 to 1.00) EDU = 0.25 (–0.19 to 0.69)	NI	NI
Rini et al, 2015	RCT	United States (North Carolina & Duke University, rural Johnston County)	- Internet-based PCST (PainCOACH) - Assessment only (control)	Baseline: PainCOACH = 4.82 (1.73) Control = 5.12 (1.81) Post-intervention: PainCOACH = 4.07 (1.99) Control = 4.62 (1.79)	Baseline: PainCOACH = 1.70 (1.30) Control = 1.89 (1.03) Post-intervention: PainCOACH = 1.73 (1.25) Control = 1.75 (1.24)	NI	NI
Khodneva et al, 2021	RCT	United States (rural Alabama, Black Belt counties)	- Cognitive behavioral therapy (CBT) plus diabetes self-management (Intervention) - General health education (GHE) peer-led	McGill Pain Intensity Score (0–45) 3-Month change: Intervention = −5.4 (−6.9 to −4.0) GHE = −3.0 (−4.4 to −1.5) 12-Month change: Intervention = −4.3 (−6.0 to −2.6) GHE = 1.0 (−2.3 to 2.5)	WOMAC (0–100) 3-Month change: Intervention = −10.3 (−13.1 to −7.5) GHE = −4.2 (−7.9 to 0.4) 12-Month change: Intervention = −11.7 (−14.5 to −8.8) GHE = 0.0 (−3.7 to 4.2)	NI	NI
Gardiner at al, 2019	RCT	United States (Boston, Massachusetts, community health centers)	- IMGV - Control group	BPI Severity (0–10) Baseline: IMGV = 7 (1.9) Control = 7 (1.8) Post-Treatment: IMGV = 6 (2.2) Control = 6 (2.2)	SF-12 Physical Composite Score (0–100) Baseline: IMGV = 33 (10.3) Control = 35 (10.6) Post-Treatment: IMGV = 36 (10.1) Control = 37 (10.4)	Baseline: IMGV = 11 (5.9) Control = 9 (5.8) Post-Treatment: IMGV = 9 (6.4) Control = 8 (6.0)	Baseline: IMGV = 67 (88%) Control = 65 (82%) Post-Treatment: IMGV = 53 (77%) Control = 54 (78%)
Madrona et al. 2016	Cohort-prospective	United States (Rural New England (primary care clinic))	- GMV (group medical visit) -TAU (therapy as usual)	The average reduction was 0.19 (95% confidence interval [CI] 0.12–0.60; p = 0.01).	The primary symptom improved on average by -0.42 (95% CI -0.31 to -0.93; p = 0.02) on the MYMOP2. Improvement of the second symptom on the MYMOP2 was -0.20 (95% CI -0.08 to -0.40; p = 0.04).	Number stopping opiates GMV = 8/42 TAU = 0/42 Number reducing opiates	NI

Stack et al 2020	Cohort-prospective	United States (Michigan, rural family medicine clinics)	- Phsycoeducational group (Opioid redution protocol) - Control group	NI	NI	GMV = 18/42 TAU = 1/42 Morphine miligram equivalent (MME) Control clinic Before: 79.88 After: 93.28 Intervention group Before: 80.34 After: 29.77	NI
Single-arm studies							
Travis et al., 2025	Single-arm open-label pilot trial	United States (Oregon & Pacific Northwest, rural Veterans with SUD)	Collaborative telepain intervention, no control group	The Brief Pain Inventory Pain intensity - 1 month : 5.8 declined -0.2 - 4 month : 5.8 declined -0.78 Pain interference - 1 month : 6.4 declined -0.54 - 4 month : 6.4 declined -1.19	Depressive symtomps - 1 month : 31.6 declined -3.57 - 4 month : 31.6 declined -4.85	NI	NI
Elder et al, 2017	Cohort	United States (Kentucky, rural & urban counties))	Massage treatment	49.4% → 40.0% (12 week → 24 week)	ODI 54.1% → 42.1%, 75% of ODI improvers at 12 week maintained at 24 week	NI	NI
Pullyblank et al, 2022	Cohort	United States (rural central New York, 6-county region)	- Chronic Pain Self-Management Program (CPSMP) - Chronic Disease Self-Management Program (CDSMP)	Pain Self Efficacy 6 weeks follow-up: IMGV = 7 (1.9) Control = 7 (1.8) Post-Treatment: IMGV = 6 (2.2) Control = 6 (2.2)	NI	NI	NI

VAS — Visual Analog Scale, WPI — Worst Pain Intensity, API — Average Pain Intensity, NI — No information reported, RCT — Randomized Controlled Trial, MHP — Marine Healing Program, CE — Core Exercises, ODI — Oswestry Disability Index, NPRS — Numeric Pain Rating Scale, PE — Patient Education, MCE — Motor Control Exercise, GBP — Good Back Programme, UC — Usual Care, BS-11 — 11-point Box Scale for pain intensity, RMDQ — Roland–Morris Disability Questionnaire, CBT — Cognitive Behavioral Therapy, EDU — Pain Education, BPI — Brief Pain Inventory (Intensity/Interference), PCST — Pain Coping Skills Training, GHE — General Health Education, WOMAC — Western Ontario and McMaster Universities Osteoarthritis Index, IMGV — Integrative Medicine Group Visits, SF-12 PCS — 12-Item Short Form Survey, Physical Composite Score, GMV — Group Medical Visit, TAU — Treatment As Usual, CI — Confidence Interval, MYMOP2 — Measure Yourself Medical Outcome Profile 2, MME — Morphine Milligram Equivalent, SUD — Substance Use Disorder, CPSMP — Chronic Pain Self-Management Program, CDSMP — Chronic Disease Self-Management Program, PSE — Pain Self-Efficacy

Pain intensity and functional disability

Consistent benefits were seen in both pain and functional disability outcomes in rural and resource-limited settings (Table 2). In Nigeria, patient education combined with motor control exercise reduced pain scores from 6.2 to 2.9 and improved ODI from 23.4 to 11.6 at 20 weeks, while the "Good Back" program lowered pain from 6.8 to 2.8 and RMDQ from 17.0 to 7.0 compared to deterioration in usual care. In South Korea, a marine healing program reduced resting pain from 4.1 to 1.2 and ODI from 42.1 to 24.7, outperforming core exercises. U.S.-based trials confirmed similar patterns: literacy-adapted CBT reduced BPI intensity (−1.06) and interference (−1.66), peer-delivered CBT in rural Alabama improved WOMAC scores by −11.7 at 12 months, internet-based coping skills training and telehealth pilots yielded modest but significant pain and interference reductions, and massage therapy decreased ODI from 54.1% to 42.1%. These findings highlight that non-pharmacological, context-sensitive interventions also achieve meaningful reductions in pain intensity and disability among rural populations.

Reduction in medication use (opioid dose and pain tablets)

Several interventions demonstrated meaningful reductions in medication use alongside improvements in pain and disability (Table 2). In Nigeria, patient education plus motor control exercise lowered average pain tablet use from 10.0 to 5.1 at 8 weeks, while the "Good Back" program reduced intake from 17.3 to 3.2 tablets over two weeks, compared with no change in usual care. In the United States, structured protocols achieved substantial opioid tapering: a rural family medicine program reduced morphine equivalents from 80.3 to 29.8, while group medical visits led to eight participants discontinuing opioids and eighteen reducing their dose, versus no discontinuation in controls. Together, these findings indicate that community-based, educational, and integrative strategies in rural settings not only improve pain outcomes but also effectively decrease opioid burden and reliance on analgesic tablets.

Feasibility

Feasibility considerations were explicitly reported in six of the thirteen included studies, providing valuable insights into the practical challenges and opportunities for delivering chronic pain interventions in rural and resource-limited settings. Evidence from Nigeria highlighted both the promise and barriers of community-based models. Igwesi-Chidobe et al. (2019) reported high recruitment and retention for the program, affirming its cultural acceptability, yet also underscored barriers such as transportation difficulties, stigma, and low literacy, all of which remain significant obstacles to implementation in low-resource contexts. Complementary evidence from Ibrahim et al. (2023) reinforced the potential of scalable interventions, showing that motor control exercise was cost-efficient for reducing disability, while patient education was particularly valuable in addressing maladaptive beliefs. Importantly, the combination of these approaches yielded the most durable outcomes, suggesting that multi-component strategies can be both feasible and effective when adapted to the realities of rural African healthcare.

In high-income settings, feasibility was similarly well established, though with a stronger focus on accessibility and indirect cost savings. Rini et al. (2015) demonstrated that an automated internet-based program, PainCOACH, was both highly acceptable and associated with minimal attrition, underscoring its scalability and potential as a cost-efficient alternative to traditional in-person therapy in geographically isolated populations. Pullyblank et al. (2022) showed that peer-led self-management workshops in rural New York achieved high completion rates and

provided a more affordable model compared to clinician-led programs, making them an attractive option for community delivery. Gardiner et al. (2019) reported that integrative medicine group visits not only demonstrated strong feasibility in underserved urban communities but also reduced emergency department use and medication reliance, highlighting their potential to lower healthcare costs. In addition, Stack et al. (2020) confirmed that structured opioid tapering protocols could be safely integrated into rural family medicine clinics, with implications for long-term cost savings through reduced opioid-related morbidity and mortality. These findings suggest that feasibility in rural pain management depends on addressing structural barriers such as literacy, stigma, and transport, while leveraging peer-led, technology-supported, and integrative approaches that are low-cost, scalable, and adaptable to local contexts.

The absence of Indonesian studies on rural pain management underscores a critical evidence gap, particularly regarding feasibility and cost-effectiveness within the framework of BPJS Health Coverage. Given that BPJS already operates under substantial financial strain, interventions must demonstrate not only clinical efficacy but also affordability and scalability. Evidence from other low- and middle-income countries suggests that community-based, low-literacy–adapted, and peer-led programs can be delivered at relatively low cost while improving pain outcomes and reducing medication use. This is particularly important in Indonesia, where rural populations face similar barriers such as limited access to specialists, high transportation costs, and disparities in health literacy. Telemedicine and digital health platforms, which expanded during the COVID-19 pandemic and are increasingly recognized under BPJS, represent promising avenues to extend pain management services to remote areas while minimizing costs. Furthermore, educational and exercise-based interventions, shown in African settings to be cost-efficient—could be adapted to Indonesian cultural and linguistic contexts and potentially integrated into BPJS primary care packages. Without local cost-effectiveness data, policymakers may be hesitant to prioritize non-pharmacological pain interventions; however, the international evidence base suggests that incorporating scalable community-based and digital programs into BPJS coverage could improve access, reduce dependence on opioids and analgesics, and mitigate the growing economic burden of chronic pain in Indonesia.

Strength and Limitations

This review provides a comprehensive synthesis of pharmacologic and adjunctive pain management strategies across diverse rural and resource-limited settings, with explicit attention to feasibility. However, limitations include heterogeneity in study design and outcome measures, underrepresentation of LMIC data, and limited longitudinal evidence. Marked heterogeneity in interventions, comparators, outcomes, and follow-up constrains quantitative pooling and compels a narrative synthesis. The broad scope (not strictly pharmacologic) trades depth on drug-specific effectiveness and safety for practical breadth.

Given that the evidence base is predominantly non-pharmacologic or multimodal, rural primary care should adopt a stepped, non-drug-first model embedded in routine workflows (standard referral pathways, brief scheduled follow-ups, and simple outcome tracking and functional measures). Pharmacotherapy should be a time-limited adjunct for clearly defined indications within an opioid-stewardship bundle (start–stop rules, taper plans, structured monitoring). For Indonesia's BPJS, prioritize low-cost group formats, tele/digital modules, and task-shared coaching, with literacy adaptation, stigma-aware messaging, travel-sparing access, and reimbursement aligned to stepped-care, deprescribing, and functional gains rather than volume. Future work should deliver pragmatic, cost-relevant trials and hybrid effectiveness–

implementation studies in rural clinics using co-primary clinical outcomes, safety endpoints, and feasibility metrics.

CONCLUSION

In rural and resource-limited settings, non-pharmacologic and multimodal strategies consistently improve pain-related function and quality of life, while evidence for pharmacologic management is comparatively sparse. Implementation is feasible via low-cost group and tele formats, literacy adaptation, stigma-aware communication, and simple outcome tracking, with likely gains in deprescribing and cost containment. Development prospects include integrating these packages into BPJS benefits and referral pathways, community-based coaching capacity, and leveraging digital platforms, while future studies should embed pragmatic, BPJS- and cost-linked hybrid trials and claims-based evaluations to confirm effectiveness, equity, and cost-effectiveness in Indonesian rural clinics.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest related to the writing or publication of this article.

REFERENCES

Baek, J. E., Kim, S. H., Shin, H. J., & Cho, H. Y. (2025). Effect of a healing program using marine resources on reducing pain and improving physical function in patients with non-specific chronic low back pain: A randomized controlled trial. Medicina, 61(2), 172. https://doi.org/10.3390/medicina61020172

BPJS Kesehatan. (2023). [Information document]. https://web.bpjs-kesehatan.go.id/uploads/information/05072024032036-d0e43b7b-4628-4963-8cb4-a2104605a2e6.pdf?utm_source=

BPJS Kesehatan. (2025). [Homepage]. https://bpjs-kesehatan.go.id/#/

Cohen, S. P., Vase, L., & Hooten, W. M. (2021). Chronic pain: An update on burden, best practices, and new advances. The Lancet, 397(10289), 2082–2097. https://doi.org/10.1016/S0140-6736(21)00393-7

Eaton, L. H., Langford, D. J., Meins, A. R., Rue, T., Tauben, D. J., & Doorenbos, A. Z. (2018). Use of self-management interventions for chronic pain management: A comparison between rural and nonrural residents. Pain Management Nursing, 19(1), 8–13. https://doi.org/10.1016/j.pmn.2017.06.001

Elder, W. G., Munk, N., & Jones, R. (2017). Real-world massage therapy for chronic pain in underserved populations: A randomized comparative effectiveness study. Pain Medicine, 18(10), 1872–1883. https://doi.org/10.1093/pm/pnx170

Gardiner, P., Luo, M., D'Amico, S., Gergen-Barnett, K., White, L. F., Saper, R., Mitchell, S., & Liebschutz, J. M. (2019). Effectiveness of integrative medicine group visits in chronic pain and depressive symptoms: A randomized controlled trial. PLoS ONE, 14(12), e0225540. https://doi.org/10.1371/journal.pone.0225540

Guy, G. P., Miller, G. F., Legha, J. K., Rikard, S. M., Strahan, A. E., Mikosz, C., & Florence, C. S. (2025). Economic costs of chronic pain—United States, 2021. Medical Care, 63(9), 679–685. https://doi.org/10.1097/MLR.0000000000002021

Ibrahim, A. A., Akindele, M. O., & Ganiyu, S. O. (2023). Effectiveness of patient education plus motor control exercise versus patient education alone versus motor control exercise alone for rural community-dwelling adults with chronic low back pain: A randomised clinical trial. BMC Musculoskeletal Disorders, 24(1), 142. https://doi.org/10.1186/s12891-022-06108-9

Igwesi-Chidobe, C. N., Godfrey, E. L., Kitchen, S., Onwasigwe, C. N., & Sorinola, I. O. (2019). Community-based self-management of chronic low back pain in a rural African primary care setting: A feasibility study. Primary Health Care Research & Development, 20(e45), 1–8. https://doi.org/10.1017/S1463423619000070

Jensen, L., Monnat, S. M., Green, J. J., Hunter, L. M., & Sliwinski, M. J. (2020). Rural population health and aging: Toward a multilevel and multidimensional research agenda for the 2020s. American Journal of Public Health, 110(9), 1328–1331. https://doi.org/10.2105/AJPH.2020.305728

Khalid, S., Sambamoorthi, U., Umer, A., Lilly, C. L., Gross, D. K., & Innes, K. E. (2022). Increased odds of incident Alzheimer's disease and related dementias in presence of common non-cancer chronic pain conditions in Appalachian older adults. Journal of Aging and Health, 34(2), 158–172. https://doi.org/10.1177/08982643211030477

Khodneva, Y., Williams, J. S., Safford, M. M., & Halanych, J. H. (2021). Peer support interventions for patients with diabetes and chronic pain in rural Alabama: A randomized controlled trial. Journal of General Internal Medicine, 36(3), 729–737. https://doi.org/10.1007/s11606-020-06277-0

Liu, C. T., Wu, B. Y., Chen, Y. H., & Tsai, M. Y. (2022). Pain experiences and coping strategies in rural older adults with chronic musculoskeletal pain in mountainous areas of Taiwan. Pain Management Nursing, 23(5), 524–531. https://doi.org/10.1016/j.pmn.2021.08.010

Lovejoy, T. I., Wu, T. Y., Maloy, P., McPherson, S. M., Smith, C. L., & Zaccari, B. (2025). Collaborative tele-pain and substance use disorder care for patients in a rural setting: Results of a single-arm open-label pilot trial. Pain Management Nursing, 26(3), 264–270. https://doi.org/10.1016/j.pmn.2024.12.020

Mehl-Madrona, L., Mainguy, B., & Plummer, J. (2016). Integration of complementary and alternative medicine therapies into primary-care pain management for opiate reduction in a rural setting. Journal of Alternative and Complementary Medicine, 22(8), 621–626. https://doi.org/10.1089/acm.2015.0271

Pullyblank, K., Brunner, W., Scribani, M., Krupa, N., Wyckoff, L., & Strogatz, D. (2022). Evaluation of a peer-led chronic pain self-management program in a rural population. Journal of Primary Care & Community Health, 13, 21501319221121464. https://doi.org/10.1177/21501319221121464

Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F. J., Mogil, J. S., Ringkamp, M., Sluka, K. A., & Song, X. J. (2020). The revised International Association for the Study of Pain definition of pain: Concepts, challenges, and compromises. Pain, 161(9), 1976–1982. https://doi.org/10.1097/j.pain.0000000000001939

Rikard, S. M. (2023). Chronic pain among adults—United States, 2019–2021. MMWR. Morbidity and Mortality Weekly Report, 72(24), 647–652. https://doi.org/10.15585/mmwr.mm7224a1

Rini, C., Porter, L. S., Somers, T. J., McKee, D. C., DeVellis, R. F., Smith, M., … Keefe, F. J. (2015). Automated internet-based pain coping skills training to manage osteoarthritis pain: A randomized controlled trial. Pain, 156(5), 837–848. https://doi.org/10.1097/j.pain.0000000000000121

Stack, M., Cooke, C. E., & Kroll, D. S. (2020). Effects of implementing a comprehensive opioid reduction protocol in rural primary care: A prospective cohort study. Journal of the American Board of Family Medicine, 33(4), 574–583. https://doi.org/10.3122/jabfm.2020.04.190399

Thorn, B. E., Eyer, J. C., Van Dyke, B. P., Torres, C. A., Burns, J. W., Kim, M., … Tucker, D. H. (2018). Literacy-adapted cognitive behavioral therapy versus education for chronic pain at low-income clinics: A randomized controlled trial. Annals of Internal Medicine, 168(7), 471–480. https://doi.org/10.7326/M17-0972

Wu, A., March, L., Zheng, X., Huang, J., Wang, X., Zhao, J., Blyth, F. M., Smith, E., Buchbinder, R., & Hoy, D. (2020). Global low back pain prevalence and years lived with disability from 1990 to 2017: Estimates from the Global Burden of Disease Study 2017. Annals of Translational Medicine, 8(6), 299. https://doi.org/10.21037/atm.2020.02.175

Yuniarti, E., Prabandari, Y. S., Kristin, E., & Suryawati, S. (2019). Rationing for medicines by health care providers in Indonesia National Health Insurance System at hospital setting: A qualitative study. Journal of Pharmaceutical Policy and Practice, 12(1), 7. https://doi.org/10.1186/s40545-019-0167-6

Zhu, M., Zhang, J., Liang, D., Qiu, J., Fu, Y., Zeng, Z., Han, J., Zheng, J., & Lin, L. (2025). Global and regional trends and projections of chronic pain from 1990 to 2035: Analyses based on global burden of diseases study 2019. British Journal of Pain, 19(2), 125–137. https://doi.org/10.1177/20494637231104318

Zis, P., Daskalaki, A., Bountouni, I., Sykioti, P., Varrassi, G., & Paladini, A. (2017). Depression and chronic pain in the elderly: Links and management challenges. Clinical Interventions in Aging, 12, 709–720. https://doi.org/10.2147/CIA.S113576