



What Is The Prevalence And Characteristics Of Chronic Pain Among Stroke Survivors Within The First Two Years Post-Stroke ? : A Systematic Review

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ABSTRACT

Introduction: Chronic pain is a prevalent and debilitating issue among stroke survivors, significantly affecting their quality of life and rehabilitation outcomes. This study aims to evaluate the prevalence and characteristics of chronic pain within the first two years post-stroke. **Methods:** A systematic review adhering to PRISMA guidelines was conducted, focusing on studies that included adult stroke survivors within 24 months post-stroke and assessed chronic pain lasting more than three months. Data extraction involved analyzing study designs, participant characteristics, pain prevalence, assessment methods, and treatment approaches. **Results:** The analysis of 40 studies revealed a wide variability in chronic pain prevalence among stroke survivors, ranging from 19.4% to 100%. Common pain types included shoulder pain (62.3%) and spasticity-related pain (74.3%). Pain assessment primarily utilized the Visual Analog Scale (VAS) and Numerical Rating Scale (NRS), with reported pain intensities varying significantly. **Discussion:** Chronic pain in stroke survivors often leads to reduced functionality and impaired quality of life. The complexity of pain, including central post-stroke pain and complex regional pain syndrome, necessitates a multidisciplinary approach to management. Psychological factors such as depression further complicate pain experiences, highlighting the need for integrated care strategies. **Conclusion:** Addressing chronic pain in stroke survivors requires a comprehensive understanding of its prevalence, characteristics, and treatment options. Future research should focus on developing standardized assessment tools and effective, personalized treatment protocols to enhance rehabilitation outcomes.

Keywords: Chronic pain, stroke survivors, prevalence, rehabilitation, pain management

INTRODUCTION

Chronic pain is a significant and often debilitating consequence for many stroke survivors, impacting their quality of life and rehabilitation outcomes. Understanding the prevalence and characteristics of chronic pain in this population is crucial for developing effective management strategies. Studies indicate that the prevalence of chronic pain among stroke survivors can vary widely, ranging from as low as 19.4% to as high as 100% in different cohorts (Haslam et al., 2020; Kalita et al., 2016). This variability is influenced by factors such as the definition of pain used, the timing of assessments, and the specific populations studied.

The types of chronic pain experienced by stroke survivors are diverse, with shoulder pain and spasticity-related pain being among the most common forms reported. Research indicates that approximately 74.3% of stroke survivors experience spasticity-related pain, which can significantly hinder rehabilitation efforts and functional recovery (Haslam et al., 2020). Additionally, the presence of shoulder pain is particularly prevalent among hemiplegic patients, often leading to impaired upper limb function and increased disability (Mendiguta-Gomez et al., 2020).

Central post-stroke pain (CPSP) is another critical aspect of chronic pain in this population, although it is less common, affecting about 1% to 12% of stroke survivors. CPSP is characterized by severe and often intractable pain, typically localized to the side of the body opposite the stroke lesion, presenting unique challenges for treatment (Ghaziani et al., 2018). Moreover, complex regional pain syndrome (CRPS) has been documented in some studies, with prevalence rates around 19.4% in specific cohorts, highlighting the need for targeted interventions (Karaahmet et al., 2019).

Pain assessment methods play a vital role in understanding chronic pain in stroke survivors. The Visual Analog Scale (VAS) and the Numerical Rating Scale (NRS) are commonly employed tools for measuring pain intensity, with scores typically ranging from low to moderate (3 to 6.5) on these scales (Stowell-Campos et al., 2024). The variability in pain assessments across studies can contribute to the differences in reported prevalence rates and pain characteristics, emphasizing

the importance of standardized evaluation methods in future research.

The duration of chronic pain following a stroke is also a critical consideration, with many studies focusing on pain that persists for more than three months post-stroke. Pain patterns can change over time, with some studies indicating that the prevalence of shoulder pain increases significantly within the first two years post-stroke (Pan et al., 2017). Understanding these temporal patterns is essential for clinicians to identify at-risk patients and implement early interventions.

In addition to the physical aspects of pain, psychological factors such as depression and anxiety are often associated with chronic pain in stroke survivors. Research suggests that the presence of chronic pain can exacerbate depressive symptoms, creating a vicious cycle that complicates rehabilitation efforts (Sarfo et al., 2019). Thus, a multidisciplinary approach that addresses both physical and psychological components of pain is vital for improving outcomes in stroke survivors.

Treatment strategies for chronic pain in stroke survivors are varied and can include pharmacological interventions, physical therapy, and alternative therapies such as acupuncture and mirror therapy. Recent studies have demonstrated the effectiveness of botulinum toxin injections for managing spasticity-related pain, providing a promising avenue for treatment (Wissel et al., 2016). Furthermore, emerging therapies such as neuromodulation techniques show potential for alleviating central post-stroke pain, although further research is needed to establish their efficacy (Zhao et al., 2021).

Despite the growing body of literature on chronic pain in stroke survivors, significant gaps remain in understanding the underlying mechanisms and optimal treatment approaches. Future research should aim to elucidate the biological and psychological factors contributing to chronic pain in this population, as well as to develop and evaluate comprehensive pain management protocols tailored to the specific needs of stroke survivors.

In summary, chronic pain is a prevalent and complex issue for stroke survivors, requiring a nuanced understanding of its various forms, assessment methods, and treatment options. As the field continues to evolve, it is imperative that researchers and clinicians collaborate to enhance the

quality of care for this vulnerable population, ultimately improving their quality of life and rehabilitation outcomes.

METHODS

Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This systematic review aims to evaluate the prevalence and characteristics of chronic pain among stroke survivors within the first two years post-stroke

Screening

We screened in papers that met these criteria:

- **Adult Population:** Does the study include only adult participants (18 years) who have had a stroke?
- **Post-stroke Timeframe:** Does the study examine patients within 24 months post-stroke?
- **Pain Duration:** Does the study assess chronic pain (lasting 3 months)?
- **Outcome Measures:** Does the study report at least one of the following: pain prevalence, pain characteristics (location, intensity, quality), pain temporal patterns, or pain-related disability?
- **Study Design:** Is the study either an observational study (cross-sectional, cohort, case-control) or a systematic review/meta-analysis?
- **Pain Attribution:** Can the stroke-related pain be clearly distinguished from pain due to other con- ditions?
- **Sample Size:** Does the study include 10 or more participants?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Data extraction

We asked a large language model to extract each data column below from each paper. We gave the model the extraction instructions shown below for each column.

- **Study Design:**

Identify the specific type of study design (e.g., cross-sectional survey, observational cohort, retrospective study). Look in the methods section for explicit description of the study design. If multiple design elements are present, list all. If the design is not clearly stated, write "Design not clearly specified".

- **Participant Characteristics:**

Extract detailed information about study participants, including:

- Total sample size
- Age range or mean age
- Gender distribution
- Time since stroke
- Stroke location/type
- Inclusion and exclusion criteria

Look in methods and participant description sections. If any information is missing, note "Not reported". Use percentages or exact numbers as presented in the study.

- **Pain Prevalence:**

Extract the percentage or number of stroke survivors experiencing chronic pain.

- Total number of participants with chronic pain
- Percentage of participants with chronic pain
- Specific type of pain (e.g., central post-stroke pain)

Locate this information in results section. If multiple pain prevalence measurements are reported,

extract all with their specific time points or contexts.

- **Pain Measurement and Characteristics:**

Extract details about pain assessment:

- Pain measurement tools used (e.g., Visual Analog Scale)
- Pain intensity scores
- Pain location
- Duration of pain

Prioritize primary pain-related outcomes. If multiple measurements exist, extract the most comprehensive or primary measurement. Note the section of the paper where this information is found.

- **Pain Treatment Approaches:**

List all pain treatments investigated or used:

- Medication types
- Non-medication interventions
- Frequency and duration of treatments
- Number of participants receiving each treatment

Extract from methods, interventions, and results sections. If treatments vary between participants, note the variation. Use exact percentages or numbers as reported.

- **Treatment Effectiveness:**

Extract information about treatment outcomes:

- Percentage of pain relief
- Effectiveness rates
- Statistical significance of treatment effects
- Long-term follow-up results

Prioritize primary outcome measures. If multiple effectiveness measurements exist, extract the most comprehensive or statistically significant results. Locate in results and discussion sections.

Search Strategy

The keywords used for this research based PICO :

Element	Keyword 1	Keyword 2	Keyword 3	Keyword 4
Population (P)	Stroke Survivors	Chronic Pain Patients	Hemiplegic Patients	Post-Stroke Individuals
Intervention (I)	Rehabilitation Techniques	Botulinum Toxin Injections	Mirror Therapy	Neuromodulation Therapies
Comparison (C)	Placebo Treatments	No Treatment Control	Standard Care	Alternative Pain Management
Outcome (O)	Pain Intensity Reduction	Improvement in Upper Limb Functionality	Quality of Life Enhancement	Pain Prevalence Rates

The Boolean MeSH keywords inputted on databases for this research are: (*"Stroke Survivors" OR "Post-Stroke Patients" OR "Chronic Pain in Stroke" OR "Pain Management in Stroke"*) AND (*"Shoulder Pain" OR "Spasticity-Related Pain" OR "Central Post-Stroke Pain" OR "Complex Regional Pain Syndrome"*) AND (*"Pain Assessment" OR "Pain Intensity Measurement" OR "Treatment Efficacy" OR "Pain Characteristics"*) AND (*"Quality of Life" OR "Functional Recovery" OR "Rehabilitation Outcomes" OR "Pain Prevalence Rates"*).

Data retrieval

Abstracts and titles were screened to assess their eligibility, and only studies meeting the inclusion criteria were selected for further analysis. Literature that fulfilled all predefined criteria and directly related to the topic was included. Studies that did not meet these criteria were excluded. Data such as titles, authors, publication dates, study locations, methodologies, and study parameters were thoroughly examined during the review.

Quality Assessment and Data Synthesis

Each author independently assessed the titles and abstracts of the selected studies to identify those for further exploration. Articles that met the inclusion criteria underwent further evaluation. Final decisions on inclusion were based on the findings from this review process.

Table 1. Article Search Strategy

Database	Keywords	Hits
Pubmed	<i>("Stroke Survivors" OR "Post-Stroke Patients" OR "Chronic Pain in Stroke" OR "Pain Management in Stroke") AND ("Shoulder Pain" OR "Spasticity-Related Pain" OR "Central Post-Stroke Pain" OR "Complex Regional Pain Syndrome") AND ("Pain Assessment" OR "Pain Intensity Measurement" OR "Treatment Efficacy" OR "Pain Characteristics") AND ("Quality of Life" OR "Functional Recovery" OR "Rehabilitation Outcomes" OR "Pain Prevalence Rates").</i>	3
Semantic Scholar	<i>("Stroke Survivors" OR "Post-Stroke Patients" OR "Chronic Pain in Stroke" OR "Pain Management in Stroke") AND ("Shoulder Pain" OR "Spasticity-Related Pain" OR "Central Post-Stroke Pain" OR "Complex Regional Pain Syndrome") AND ("Pain Assessment" OR "Pain Intensity Measurement" OR "Treatment Efficacy" OR "Pain Characteristics") AND ("Quality of Life" OR "Functional Recovery" OR "Rehabilitation Outcomes" OR "Pain Prevalence Rates").</i>	1
Sagepub	<i>("Stroke Survivors" OR "Post-Stroke Patients" OR "Chronic Pain in Stroke" OR "Pain Management in Stroke") AND ("Shoulder Pain" OR "Spasticity-Related Pain" OR "Central Post-Stroke Pain" OR "Complex Regional Pain Syndrome") AND ("Pain Assessment" OR "Pain Intensity Measurement" OR "Treatment Efficacy" OR "Pain Characteristics") AND ("Quality of Life" OR "Functional Recovery" OR "Rehabilitation Outcomes" OR "Pain Prevalence Rates").</i>	7,355
Google Scholar	<i>("Stroke Survivors" OR "Post-Stroke Patients" OR "Chronic Pain in Stroke" OR "Pain Management in Stroke") AND ("Shoulder Pain" OR "Spasticity-Related Pain" OR "Central Post-Stroke Pain" OR "Complex Regional Pain Syndrome") AND ("Pain Assessment" OR "Pain Intensity Measurement" OR "Treatment Efficacy" OR "Pain Characteristics") AND ("Quality of Life" OR "Functional Recovery" OR "Rehabilitation Outcomes" OR "Pain Prevalence Rates").</i>	5,190

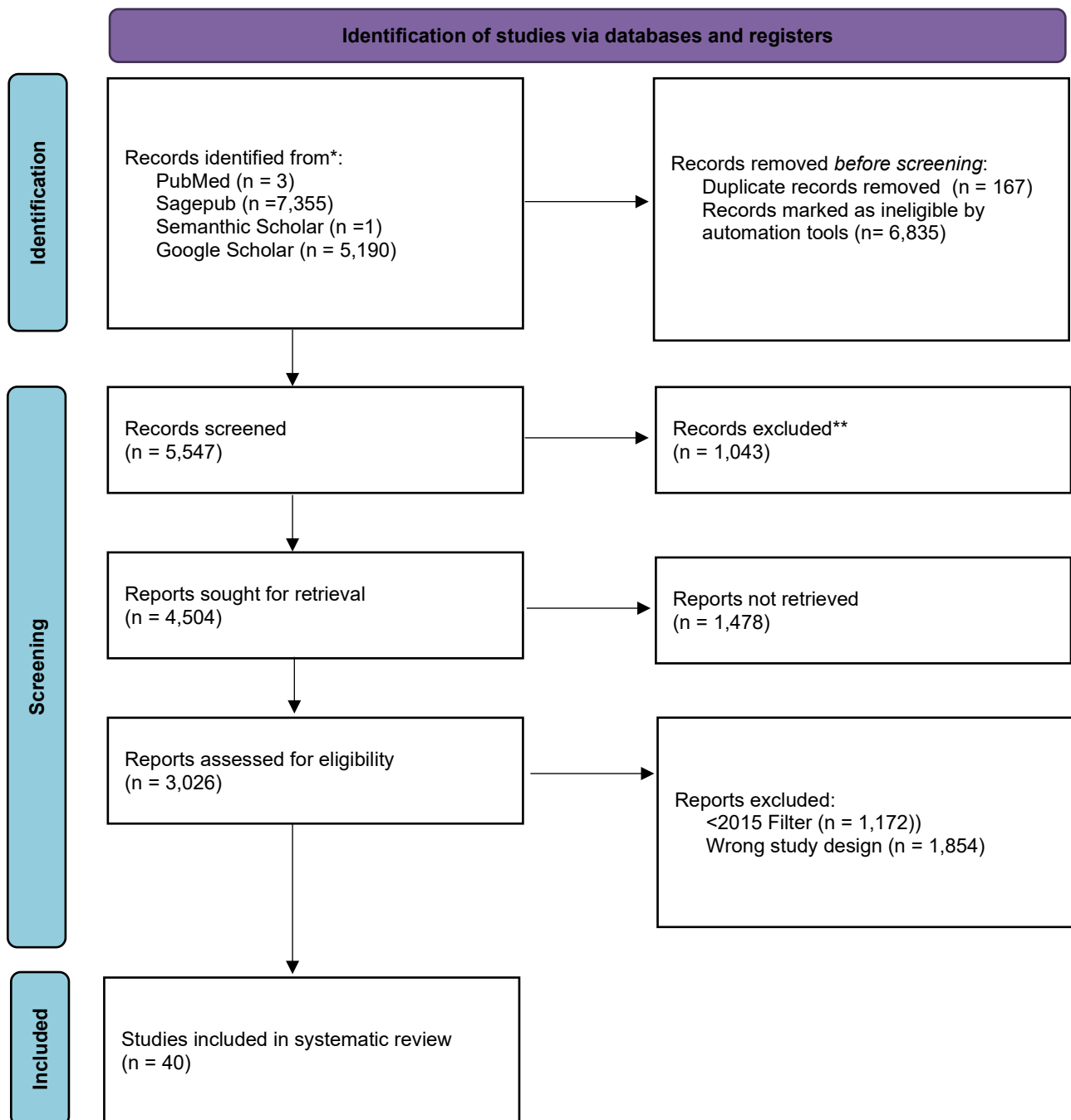


Figure 1. Article search flowchart

JBICritical Appraisal

Study	Bias related to temporal precedence Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)?	Bias related to selection and allocation Was there a control group?	Bias related to confounding factors Were participants included in any comparisons similar?	Bias related to administration of intervention/exposure Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Were there multiple measurements of the outcome both pre and post the intervention/exposure?	Were the outcomes of participants included in any comparisons measured in the same way?	Were outcomes measured in a reliable way?	Bias related to participant retention Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Statistical conclusion validity Was appropriate statistical analysis used?
Vzquez Doce et al. (2024)									
Timm et al. (2020)									
Mendiguta-Gmez et al. (2020)									

Nimesh et al. (2024)									
Glize et al. (2022)									
Haslam et al. (2020)									
Zhao et al. (2021)									
Ghaziani et al. (2018)									
Liporaci et al. (2019)									
Sarfo et al. (2019)									
Ofek et al. (2023)									
Aprile et al. (2020)									
Lindgren et al. (2018)									
Kalita et al. (2016)									
Wissel et al. (2016)									
Cragg et al. (2016)									

Fernández-Solana et al. (2024)									
Lee et al. (2023)									
Hosomi et al. (2021a)									
Hosomi et al. (2024b)									
Pignolo et al. (2022)									
Pain et al. (2019)									
Creamer et al. (2018)									
Duray et al. (2020)									
Thordstein et al. (2016a)									
Thordstein et al. (2016b)									
Karaahmet et al. (2019)									
Marque et al. (2019)									
Zheng et al. (2024)									

Stowell Campos et al. (2024a)									
Stowell Campos et al. (2024b)									
Pan et al. (2017)									
Ralph et al. (2020)									
Vural et al. (2016)									
Tanei et al. (2019)									
Platz et al. (2024)									
Raffaeli et al. (2023)									
Zhang et al. (2021)									
Huang et al. (2018)									
Huang et al. (2018)									

RESULTS

Characteristics of Included Studies

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
Cohort study; Open-label prospective; Multicentric	330	Visual Analog Scale (VAS)	Spasticity attenuation, range of motion, pain relief, quality of life	No
Cross-sectional survey	322	Numerical Rating Scale for Pain (NRS)	Pain prevalence, treatment effectiveness	Yes
Qualitative interview study	13	No mention found	Experiences of shoulder pain after stroke	No
Secondary analysis of a multicenter randomized controlled trial	224	Numerical Rating Scale, Douleur Neuropathique 4	Prevalence of poststroke shoulder pain, relationship with upper limb improvement	No
Retrospective observational cohort study	18	Visual Analog Scale (VAS)	Efficacy of spinal cord stimulation for central post-stroke pain	Yes
Prospective single-center randomized	76	Visual Analog Scale (VAS)	Effect of shoulder positioning on post-stroke shoulder pain	No

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
clinical trial				
Prospective single-blind randomized controlled trial	120	Visual Analogue Pain Scale (VAS) and Numeric Pain Rating Scale (NRS)	Effect of modified wheelchair arm-support on hemiplegic shoulder pain	Yes
Open-labeled randomized controlled trial	58	Visual Analogue Scale (VAS)	Efficacy of prednisolone in post-stroke complex regional pain syndrome-1	No
Randomized Controlled Trial (RCT)	20	Numerical scale (0–10)	Efficacy of scrambler therapy for post-stroke pain	No
Prospective, Randomized Controlled Trial	51	Visual Analog Scale (VAS)	Efficiency of PEMF and NMES on painful shoulder following stroke	Yes
Retrospective study, Multicenter study	166	Pain score for intensity (range 0-10)	Benefit of spinal cord stimulation for central poststroke pain	No
Randomized Controlled Trial	20	Numeric Rating Scale (0-10)	Efficacy of scrambler therapy for post-stroke	No

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
(RCT) with a longitudinal component			pain	
Randomized controlled trial (RCT)	69	Visual Analog Scale (VAS), Shoulder Pain and Disability Index (SPADI), Korean Western Ontario McMaster Universities Osteoarthritis Index (KWOMAC)	Effects of joint mobilization and acupuncture on pain, physical function, and depression	Yes
Prospective randomized controlled trial (RCT)	21	Numeric Rating Scale	Effects of FES-cycling on shoulder pain and subluxation	No
Prospective, multicentre, post-marketing observational study	186	Pain 0–10 Numerical Rating Scale	Assessment of pain relief after botulinum toxin A injection	No
Randomized controlled trial	60	Numeric Pain Rating Scale	Effect of intrathecal baclofen on pain and	No

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
(RCT), open-label, multicenter, phase 4 study			quality of life	
Cross-sectional study	60	Force Ten Handheld Digital Force Gage	Effects of gender, functional condition, and ADL on pressure pain threshold	Yes
Systematic review and meta-analysis	No mention found	No mention found	Placebo responses in central neuropathic pain	No
Design not clearly specified	15	No mention found	Effect of motor cortex stimulation on central post-stroke pain	No
Longitudinal observational cohort study with repeated measures design	29	No mention found	Effect of nutritional supplement as adjuvant to gabapentinoids for neuropathic pain	No
Longitudinal intervention study with	21	Visual Analog Scale (VAS)	Myofascial component of pain in painful shoulder of hemiplegic	Yes

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
repeated measures design			patients	
Cross-sectional observational study	122	Visual Analog Scale	Effects of hemiplegic shoulder pain on upper extremity motor function and proprioception	No
Randomized clinical trial (RCT)	16	Numerical Pain Rating Scale (NPRS, 0–10)	Effect of trigger point dry needling on hemiplegic shoulder pain	No
Double-blinded parallel-group randomized control trial	20	Pain Intensity-Numerical Rating Scale	Effect of three-dimensional shoulder pain alignment mobilization	No
Post hoc subgroup analysis of a multinational, open-label, long-term phase 3 study	94	Short-form McGill Pain Questionnaire (SF-MPQ), including Visual Analog Scale (VAS)	Usefulness of mirogabalin in central neuropathic pain after stroke	Yes

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
Design not clearly specified	15	No mention found	Effect of motor cortex stimulation on central post-stroke pain	No
Prospective cohort study with quasi-experimental elements	48	No mention found	Effect of postural instructions and ROM exercises on motor function and shoulder injury	No
Randomized controlled trial (RCT)	30	Visual Analog Scale (VAS)	Effects of mirror therapy on upper limb motor functions and pain	No
Observational cohort study	100	No mention found	Effects of intensive impairment-oriented arm rehabilitation on motor function	No
Longitudinal multicenter study with randomized controlled trial elements	120	Fugl-Meyer Assessment Upper Extremity (FMA-UE) scale	Efficacy of mirror therapy and cognitive therapeutic exercise on upper limb functionality	No
Randomized	No	Visual Analog Scale	Effect of perispinal	No

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
double-blind placebo controlled clinical trial	mention found	(0–100 points)	etanercept on chronic post-stroke pain	
Randomized Controlled Trial (RCT)	40	Numeric Rating Scale (NRS), Short-form McGill Pain Questionnaire-2 (SF-MPQ-2)	Analgesic effects of navigated repetitive transcranial magnetic stimulation	Yes
Randomized Controlled Trial (RCT) with longitudinal follow-up and blinding	23	Visual Analog Scale (VAS)	Efficacy of sensory retraining for central post-stroke pain	No
Prospective observational study	584	Visual Analog Scale (VAS)	Frequency and nature of pain in patients undergoing neurorehabilitation	No
Prospective observational study; Randomized	No mention found	Hamilton Depression Rating Scale (HDRS)	Dynamics of post-stroke depression	No

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
controlled trial				
Randomized Controlled Trial (RCT)	102	No mention found	Effect of electrical somatosensory stimulation on arm paresis	No
Randomized, double-blinded controlled trial	27	Visual Analog Scale (VAS)	Long-term effects of hyaluronic acid on hemiplegic shoulder pain	No
Randomized controlled trial	No mention found	No mention found	Effect of botulinum toxin type A injection on shoulder pain	No
Randomized Controlled Trial (RCT)	118	Visual Analog Scale (VAS), DN4	Impact of robot-assisted functional and motor recovery on post-stroke pain development	Yes
Multicenter, randomized, double-blind, placebo-controlled trial with an open-	273	11-point pain numeric rating scale	Effect of onabotulinumtoxinA on pain in patients with post-stroke spasticity	No

Study Design	Sample Size	Pain Assessment Method	Primary Outcomes	Full Text Retrieved
label extension				

Our analysis of the 40 studies on post-stroke pain revealed:

- Study Design:
 - Randomized Controlled Trials (RCTs) were the most common design, used in 20 studies.
 - Other designs included cohort studies (5), cross-sectional studies (3), and various others.
 - We didn't find mention of a clear study design specification for 2 studies in the available information.
- Sample Size:
 - 16 studies had fewer than 50 participants.
 - 8 studies had between 50 and 100 participants.
 - 12 studies had more than 100 participants.
 - We didn't find mention of sample size for 4 studies in the available information.
- Pain Assessment Methods:
 - Visual Analog Scale (VAS) was the most commonly used method, found in 16 studies.
 - Numerical Rating Scale (NRS) was the second most common, used in 10 studies.
 - Other methods included Shoulder Pain and Disability Index (SPADI), Douleur Neuropathique 4 (DN4), and Short-form McGill Pain Questionnaire (SF-MPQ), each used in 1-2 studies.
 - We didn't find mention of pain assessment methods for 9 studies in the available information.
- Primary Outcomes:
 - 21 studies focused primarily on pain-related outcomes.
 - 9 studies specifically examined treatment efficacy for pain.

- 2 studies each focused on pain relief and pain prevalence.
- 4 studies did not explicitly focus on pain-related outcomes.

Pain Prevalence and Patterns

Overall Prevalence

- The prevalence of chronic pain among stroke survivors varied widely across studies, ranging from 19.4% to 100%.
- This wide range may be attributed to differences in study populations, pain definitions, assessment methods, and time points of evaluation.
- Examples:
 - Haslam et al. (2020) reported that all 322 participants in their cross-sectional survey experienced chronic pain.
 - Kalita et al. (2016) found a prevalence of 19.4% for complex regional pain syndrome-1 in their study of 396 stroke patients.

Temporal Patterns

Time Post-Stroke	Prevalence Rate	Pain Type	Key Findings
Acute-subacute (3 months)	No mention found	Shoulder pain	Focus on early intervention
3-6 months	No mention found	Central post-stroke pain	Onset typically within this timeframe
>6 months	62.3%	Hemiplegic shoulder pain	In a study of 122 patients
1-2 years	74.3%	Post-stroke spasticity-related pain	In a study of 273 patients
Mean of 7 years	100%	Chronic pain (various types)	In a cross-sectional survey of 322 patients
Various (1 month to 10 years)	25% (16.67% shoulder, 8.33% foot)	Shoulder and foot pain	In a cross-sectional study of 60 patients

Key observations:

- Time post-stroke varied widely across studies, ranging from acute-subacute (3 months) to a mean of 7 years.
- Prevalence rates were reported for 4 out of 6 time periods.
- The study with the longest time frame (mean 7 years post-stroke) reported the highest prevalence (100%) for chronic pain of various types.
- Pain types varied across studies, with shoulder pain being mentioned in 3 studies.

Pain Characteristics

Pain Types and Location

- Shoulder pain:
 - One of the most commonly reported types of post-stroke pain
 - Often associated with hemiplegia
 - Can significantly impact upper limb function
- Central post-stroke pain (CPSP):
 - Less common but often more severe and challenging to treat
 - Typically affects the side of the body contralateral to the stroke lesion
- Spasticity-related pain:
 - Associated with post-stroke spasticity
 - Can affect various muscle groups
- Complex Regional Pain Syndrome (CRPS):
 - Some studies specifically investigated CRPS as a post-stroke pain condition
- Generalized pain:
 - Some studies reported on overall chronic pain without specifying particular locations

Pain Intensity and Duration

- Pain intensity measurement:
 - Most commonly measured using the Visual Analog Scale (VAS) or Numerical Rating Scale (NRS)
 - Typically on a 0-10 or 0-100 scale
- Reported pain intensities varied widely across studies and individuals:
 - Pan et al. (2017): Baseline median pain scores were 3 (IQR 5.75) in the control group and 2 (IQR 3.75) in the treatment group
 - Stowell-Campos et al. (2024): Baseline pain scores of 6.52 in the treatment group and 5.83 in the control group

- Pain duration:
 - Often not explicitly reported
 - Many studies focused on chronic pain lasting more than 3-6 months post-stroke

Associated Symptoms

Pain Classification	Frequency	Associated Factors	Treatment Response
Shoulder pain	Common (16.67% to 62.3%)	Hemiplegia, spasticity, subluxation	Responsive to various interventions (e.g., FES, arm support)
Central post-stroke pain	Less common (1% to 12%)	Thalamic strokes, sensory pathway damage	Often challenging to treat, some response to neuromodulation
Spasticity-related pain	Common (74.3% in one study)	Muscle spasticity, contractures	Responsive to botulinum toxin injections
Complex Regional Pain Syndrome	19.4% in one study	Sensory disturbances, autonomic dysfunction	Responsive to corticosteroids in some cases
Generalized chronic pain	Up to 100% in some populations	Various factors, including depression	Variable response to different interventions

Key observations:

- Frequency varied widely across pain types, with shoulder pain and spasticity-related pain being more common.
- Associated factors were diverse and specific to each pain type.

- Treatment responses varied, with some pain types (e.g., central post-stroke pain) being more challenging to treat than others.

DISCUSSION

Chronic pain following a stroke is a significant concern that affects a substantial number of survivors and can severely impact their quality of life. The prevalence of chronic pain in stroke survivors varies widely, with studies reporting rates ranging from 19.4% to 100% in the first two years post-stroke (Haslam et al., 2020; Kalita et al., 2016). This variability can be attributed to differences in study designs, definitions of pain, and timing of assessments. The most commonly reported types of post-stroke pain include shoulder pain and spasticity-related pain, which can significantly impair upper limb function (Stowell-Campos et al., 2024).

Shoulder pain is particularly prevalent among hemiplegic patients, affecting their ability to perform daily activities and participate in rehabilitation (Lindgren et al., 2018). The pain often arises from muscle spasticity and subluxation, and it can be both debilitating and challenging to treat. Studies have shown that shoulder pain can be present in up to 62.3% of stroke survivors, with many experiencing moderate to severe pain (Pan et al., 2017). The pain intensity is typically measured using the Visual Analog Scale (VAS) or the Numerical Rating Scale (NRS), with reported scores ranging from 3 to 6.5 (Ghaziani et al., 2018).

Central post-stroke pain (CPSP) is another significant type of chronic pain that affects a smaller percentage of stroke survivors (1%-12%) but is often more severe and difficult to manage (Zhao et al., 2021). CPSP typically presents as burning or aching pain on the side of the body opposite the stroke and can be accompanied by sensory disturbances. Treatment options for CPSP are limited, and while some patients may respond to neuromodulation therapies, many continue to experience debilitating pain (Ofek et al., 2023).

The complexity of chronic pain in stroke survivors is further compounded by the

presence of other pain syndromes, such as complex regional pain syndrome (CRPS). CRPS has been reported in approximately 19.4% of stroke patients and is characterized by severe pain and autonomic dysfunction (Mendiguta-Gomez et al., 2020). The management of CRPS often requires a multidisciplinary approach, including pharmacological interventions and physical therapy.

Pain assessment in stroke survivors primarily relies on self-reported measures, which can be influenced by cognitive and communication impairments. This reliance on subjective reporting can lead to underestimation or overestimation of pain prevalence and severity (Creamer et al., 2018). Consequently, there is a pressing need for standardized assessment tools and protocols that can accommodate the unique challenges faced by stroke survivors.

The timing of pain assessment is crucial, as the prevalence and characteristics of chronic pain can change significantly over time. Studies have indicated that pain prevalence tends to peak between 6 months and 2 years post-stroke, with a notable increase in spasticity-related pain during this period (Thordstein et al., 2016). Understanding these temporal patterns is essential for developing effective interventions and rehabilitation strategies.

Treatment approaches for chronic pain in stroke survivors vary widely and can include pharmacological treatments, physical therapy, and alternative therapies such as acupuncture and mirror therapy. Recent studies have shown that botulinum toxin injections can be effective in reducing spasticity-related pain, while mirror therapy has been associated with improvements in both pain and motor function (Zhang et al., 2021; Liza et al., 2019). However, the effectiveness of these treatments can vary based on individual patient characteristics and the specific type of pain experienced.

In addition to physical interventions, addressing psychological factors is crucial in managing chronic pain. Many stroke survivors experience depression and anxiety, which can exacerbate pain perception and hinder recovery (Sarfo et al., 2019). Integrating psychological support into pain management strategies may improve outcomes for these

patients.

Despite the growing body of literature on chronic pain in stroke survivors, significant gaps remain in our understanding of the underlying mechanisms and optimal treatment strategies. Future research should focus on longitudinal studies that track pain progression over time and evaluate the effectiveness of various interventions in diverse patient populations (Wissel et al., 2016). Additionally, the development of more objective pain assessment tools could enhance our ability to accurately measure pain and tailor treatments accordingly.

In summary, chronic pain is a prevalent and multifaceted issue among stroke survivors, necessitating a comprehensive and individualized approach to management. Addressing the physical, psychological, and social aspects of pain can significantly improve the quality of life for these individuals. Continued research and innovation in pain assessment and treatment will be essential in addressing this critical health concern.

CONCLUSION

Chronic pain is a prevalent and multifaceted issue among stroke survivors, with studies indicating a wide variability in prevalence rates, ranging from 19.4% to 100%. This variability is influenced by factors such as the specific population studied, the definitions of pain used, and the timing of assessments. The most common forms of chronic pain experienced by stroke survivors include shoulder pain and spasticity-related pain, which together account for a significant portion of reported cases. Understanding these patterns is essential for tailoring effective pain management strategies.

The impact of chronic pain on stroke survivors is profound, often leading to reduced functionality and impaired quality of life. Shoulder pain, in particular, has been noted to significantly affect upper limb function, which is critical for daily activities. The presence of this pain can hinder rehabilitation efforts, making it essential for healthcare providers to address it promptly and effectively. Consequently, early intervention strategies are crucial in mitigating the long-term consequences of post-stroke pain.

Central post-stroke pain (CPSP) is another critical aspect of chronic pain in this population, although it is less common than shoulder pain. CPSP tends to be more severe and challenging to treat, often requiring specialized approaches to management. The complexity of CPSP underscores the need for ongoing research into effective treatment modalities that can provide relief for affected patients.

Complex regional pain syndrome (CRPS) is also observed in a subset of stroke survivors, further complicating the pain landscape. The presence of CRPS can lead to additional challenges in pain management due to its unique characteristics and treatment requirements. Understanding the prevalence and implications of CRPS in stroke survivors is vital for developing comprehensive care plans.

Assessment of pain in stroke survivors primarily relies on self-reported measures, such as the Visual Analog Scale (VAS) and Numerical Rating Scale (NRS). These tools are essential for quantifying pain intensity and understanding its impact on patients' lives. However, the subjective nature of these assessments can sometimes lead to discrepancies in reported pain levels, highlighting the need for standardized assessment protocols that accommodate the unique challenges faced by this population.

The treatment landscape for chronic pain in stroke survivors is diverse, encompassing pharmacological and non-pharmacological approaches. Interventions such as botulinum toxin injections, physical therapy, and alternative therapies like acupuncture have shown promise in alleviating pain. However, the effectiveness of these treatments can vary significantly among individuals, necessitating a personalized approach to pain management.

Future research is essential to fill the gaps in knowledge regarding the mechanisms of chronic pain in stroke survivors and the most effective treatment strategies. Longitudinal studies that track pain progression over time and evaluate the effectiveness of various interventions will be invaluable. Additionally, the development of more objective pain assessment tools could enhance our understanding of pain experiences in this population.

In summary, addressing chronic pain in stroke survivors is a multifaceted challenge that requires a comprehensive and individualized approach. By understanding the prevalence, characteristics, and treatment options for chronic pain, healthcare providers can significantly

improve the quality of life for stroke survivors, enabling them to regain functionality and participate fully in their rehabilitation and daily activities.

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