

A Systematic Review of Clinical Practice Guidelines for the Management of Shoulder Pain in Patients with Stroke

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ABSTRACT

Objectives: To assess the quality, scope, and consistency of relevant clinical practice guidelines (CPGs) recommendations for hemiplegic shoulder pain (HSP) management among stroke patients.

Study design: A systematic review of CPGs.

Setting: Publishing regions were North America, Europe, Asia, and Oceania.

Subjects: Adult (≥ 18 years) stroke patients who had HSP.

Methods: Seven databases were used to search for CPGs. A total of 267 articles were screened; 8 guidelines met the inclusion criteria. The Appraisal of Guideline for Research and Evaluation (AGREE-II) was used for evaluating the quality of the selected CPGs.

Results: The recommendations of 5 high-quality guidelines for post-stroke HSP management were synthesized and 5 scopes of consistent recommendations were found comprising assessment, prevention, medical treatment, physical therapy treatment, and management of shoulder subluxation.

Conclusions: The key recommendations proposed that the assessment should evaluate muscle tone and pain level; advice and education be provided to family members and caregivers on how to handle and position the shoulder correctly, and avoid exercises involving overhead pulleys to prevent HSP; medical treatment should consider the administration of analgesics, high doses of botulinum toxin injections, subacromial corticosteroid injections, and suprascapular nerve blocks; and that physical therapy approaches should employ active exercises, taping or strapping, and the management of shoulder subluxation via slings and electrical stimulation. Future up-to-date guidelines should consider all domains of AGREE-II in order to improve their quality.

Keywords: assessment, guideline, hemiplegic shoulder pain, rehabilitation, stroke

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Introduction

Although the current incidence of stroke is declining in most regions worldwide,¹ stroke still remains a serious global health problem, which is a major cause of mortality, morbidity, and disability.^{1,2} Stroke is a leading cause of long-term disability,^{3,4} between 15.0% and 30.0%.^{3,5} of stroke survivors have severe and often permanent disabilities, while 40.0% have a moderate disability.³ As a consequence, many stroke survivors experience difficulties when performing activities of daily living (ADLs) and have a reduced quality of life,^{6,7} which may result in secondary complications.⁸ Hemiplegic shoulder pain (HSP) is a complex and intense complication following a stroke.^{9,10} The incidence of HSP is high;¹¹ however, it varies between 5.0% and 84.0% depending on the definition of shoulder pain, type, severity, and timing of evaluation.^{6,9,11-18} HSP affects the stroke survivors' physical and mental well-being.¹³ Persons with HSP experience intense pain¹⁵ resulting in a limited range of motion (ROM),¹³ impaired upper limb movement,^{14,19} and restricted ability to perform ADLs,^{13,17,20,21} which lead to a worsening of their functional status.²⁰ Moreover, these problems contribute to sleep disorders and depression.^{15,17,19,21} This results in poor functional recovery,^{12, 3,15,19,21} decreased participation in social activities,^{13,17} and a lower quality of life.^{12-17,19,21,22}

The precise causes of HSP are still unclear,^{10,15,23} but it is hypothesized that multiple factors play a role in its development.^{6,11,15,17,18,24} The diverse mechanisms and contributing factors that cause HSP can be present irrespective of recovery stage.¹⁵ Such factors include (1) motor control impairment (e.g., muscle weakness, flaccidity, or limited ROM),^{10,15,17,18} (2) soft-tissue lesions (e.g., shoulder subluxation, adhesive capsulitis, or rotator cuff tear),^{10,11,14,15,17,20,25} (3) muscle tone changes (e.g., spasticity)^{10,11,14,17,25} (4) other peripheral and central nervous system dysfunctions (e.g., complex regional pain syndrome (CRPS), brachial plexus injury, peripheral

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nerve entrapment, somatosensory abnormalities, and central post-stroke pain),^{10,11,14,15,17,18,20} and (5) psychological factors (e.g., anxiety and depression).¹⁵ These presentations may occur either alone or in combination.¹⁵ Given the fact that HSP has multifactorial causes, and our understanding of its pathogenesis is still unclear, the treatment of stroke patients with HSP is challenging. Even though, various treatment approaches have been advocated, no specific treatment has been shown to be superior.^{9,11,14,17,20}

However, the provision of care should be based on clinical practice guidelines (CPGs). Such guidelines are systematically developed based on the current best scientific evidence to assist members of multidisciplinary care teams in various settings. Therefore, educating and encouraging care providers to follow the recommendations of CPG can increase the knowledge of care team members, enhance patient care, reduce practice variance, increase care efficiency, and ultimately improve treatment outcomes for stroke patients.^{26,27} Different countries employ different CPGs depending on the context of the country and the guideline developers, thus they vary in content, scope, and detail. Consequently, some differences exist between guidelines in terms of the level of evidence, strength of recommendations, and details of each recommendation.²⁶ Hence, the purpose of this study was to assess the quality, scope, and consistency of different guideline recommendations using a systematic review of CPGs for HSP management among stroke patients.

Methods

This systematic review was approved by the Human Research Ethics Committee of the Faculty of Medicine, Prince of Songkla University (REC. 64-058-30-2). This study followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

Identification and selection of guidelines and their recommendations

Guideline eligibility was based on the Population and Clinical Areas, Interventions, Comparators, Attributes of CPGs, and Recommendation characteristics (PICAR) framework²⁸ (Appendix 1) as well as on some adapted criteria from PEDro.²⁹ The inclusion criteria consisted of CPGs: (1) developed by a government or private health profession association from North America, Europe, Oceania (Australia and New Zealand), and Asia (China, Japan, Korea, and Thailand); (2) developed based on systematic literature review and containing recommendations, methods, or information to guide decisions related to the appropriate management of shoulder pain in stroke patients; (3) intended for adult stroke patients 18 years of age or older, excluding transient ischemic attack; (4) reporting at least one recommendation regarding the management of shoulder pain in stroke patients; (5) published or reported in English or Thai from 1 January, 2016 to 23 February, 2021; and (6) with the latest version selected in case of successive editions.

Search for guidelines

Literature search strategies used medical subject headings and text words related to guidelines for shoulder pain in persons with stroke. The databases consisted of Medline, Cochrane Library, Physiotherapy Evidence Database, American Physical Therapy Association, The National Institute for Health and Care Excellence, Guidelines International Network, and Google Scholar. In addition, reference lists of selected CPGs were screened for additional eligible guidelines. The keywords used in the search for guidelines comprised “cerebrovascular disease,” “stroke,” “post-stroke,” “shoulder pain,” and “guidelines.” Keywords were combined using the Boolean operators “AND” and “OR.” Two investigators (WY and LK) independently screened potential CPGs based on titles and abstracts. Disagreement on inclusion was resolved through discussion with a third investigator (TS). All decisions were made by consensus, and the reasons for excluding guidelines were recorded. The potential full-text guidelines were evaluated in the same manner.

Appraisal of guidelines

The Appraisal of Guideline for Research and Evaluation (AGREE-II) was used to assess the methodological quality of selected CPGs. It consists of 6 domains: (1) scope and purpose, (2) stakeholder involvement, (3) rigor of development, (4) clarity and presentation, (5) applicability, and (6) editorial independence. The 23-item AGREE-II tool uses a scoring system involving 7 levels from 1 (strongly disagree) to 7 (strongly agree). The higher the scores, the greater the methodological quality of the guideline. In this regard, the guidelines that achieved a score equal to or more than 60% (scores for each domain minus the lowest possible score divided by the highest possible score minus the lowest possible score) in domains 1, 3, and 6 were considered to be of a high quality,²⁸ and their recommendations for the management of shoulder pain in stroke patients were synthesized. Two investigators (WY and LK) assessed the full text of the selected CPGs independently according to the AGREE-II criteria. Total score discrepancies of more than 10% were discussed and re-assessed independently by a third investigator (TS).²⁹

Synthesis of guideline recommendations

Using textual descriptive synthesis, the scope, context, and consistency of the selected CPG recommendations were evaluated. Initially, one author (WY) read each selected CPG in order to familiarize himself with the overall information of its content. Then he coded the CPG with the aim of identifying the scopes covered by the guideline. The initial codes were identified and refined via the constant comparison of recommendations in each CPG as the data collection progressed. Finally, the guideline recommendations were compared across CPGs in order to identify any similarities and/or discrepancies related to each scope.²⁹

The level of evidence and the degree of recommendations for each CPG were converted into the same format followed the American Heart Association.⁶ This scale allows for comparison between the different recommendations of each CPG. It employs 3 levels of evidence—A (strong), B (moderate), and C (low) (Appendix 2). Four degrees of recommendation were adapted from the Oxford Center for Evidence-based Medicine Levels of Evidence. They consisted of: very recommendable, moderately recommendable, not recommended, and controversial (Appendix 3).³⁰ The authors (WY and LK) compared the selected guidelines in terms of the different scopes they covered, scope consistency, and congruence related to both their content and recommendations. Finally, the recommendations from the high-quality guidelines based on the 23-item AGREE-II tool were synthesized in order to provide an overview of all the identified recommendations.²⁹

Results

Search results

The database search found 324 guidelines in total; after removing irrelevant or duplicate guidelines, 267 relevant guidelines remained. After screening the titles and abstracts when available, 244 guidelines were excluded. Twenty-three full-text guidelines were retrieved and reviewed based on the inclusion criteria. Finally, eight guidelines were included in the study analysis (Figure 1).

Selected guideline characteristics

The 8 selected guidelines were published or reported between 2016 and 2020. Seven of them were applicable to all types of stroke, and 1 guideline was developed for ischemic stroke. Two guidelines (2 organizations) were from the United States,^{6,31} another 2 (2 organizations) came from Canada,^{19,32} 2 more (1 organization) from Thailand,^{33,34} and 1 guideline each was developed in the United Kingdom²³ and Australia³⁵ (Appendix 4).

Methodology quality

The AGREE-II domain scores for each CPG (n=8) are presented in Table 1. The percentages of the total mean domain scores obtained ranged between 35.99% and 83.51%. The mean scores (range) of each domain were: (1) scope and purpose 79.17% (47.22%–100%); (2) stakeholder involvement 64.19% (8.33%–94.44%); (3) rigor of development 65.99% (17.71%–94.79%); (4) clarity of presentation 90.97% (75%–100%); (5) applicability 27.53% (12.5%–60.42%), and (6) editorial independence 59.15% (0%–100%). Five were high-quality guidelines with a score equal to or more than 60% in domains 1, 3, and 6.

Synthesis of recommendations

Only 5 high-quality guidelines were used in recommendation synthesis and comparison. The guideline recommendations were found to be consistent in 5 scopes: assessment, prevention, medical treatment, physical therapy treatment, and management of shoulder subluxation. In brief,

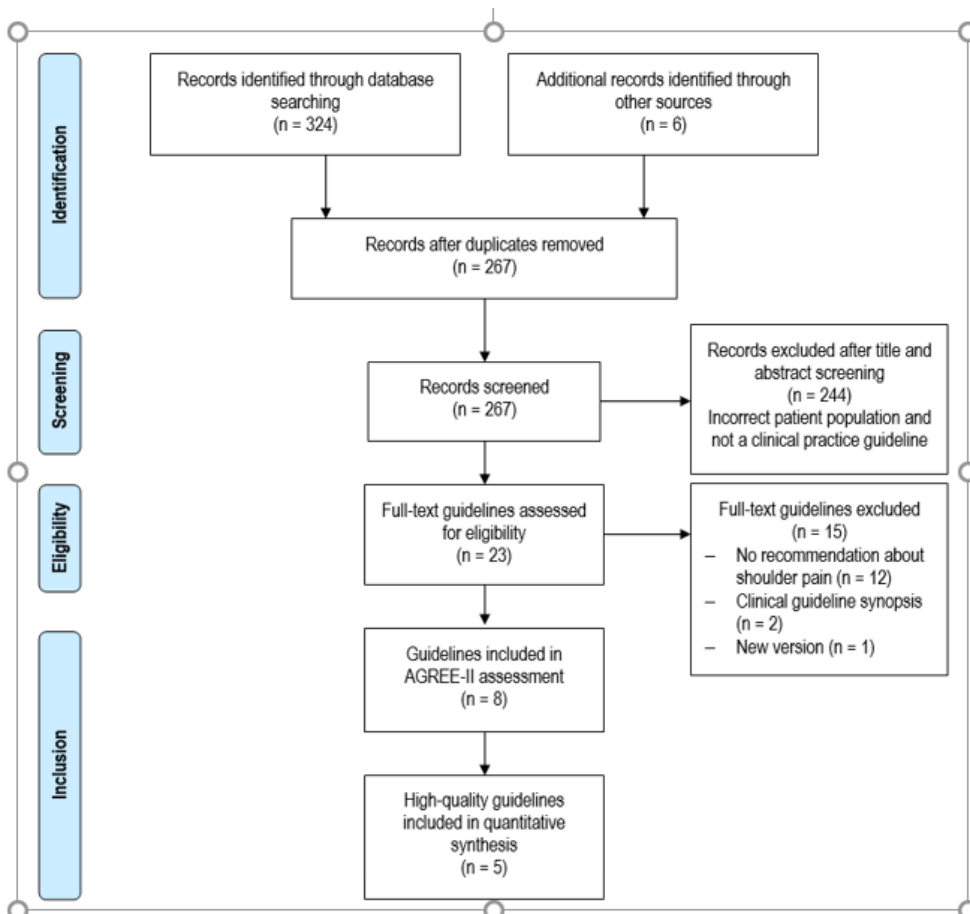


Figure 1. Flow chart of papers through the review

Table 1. Guideline assessment using the AGREE-II instrument (n = 8)

Guideline authors/organization/society	Domain scores (%)							Total mean domain score (%)
	Scope and purpose	Stakeholder involvement	Rigor of development	Clarity and presentation	Applicability	Editorial independence		
USA								
1. U.S. Department of Veterans Affairs and U.S. Department of Defense (VA/DoD) ³¹	97.22	94.44	86.46	97.22	16.67	87.5	79.92	
2. Winstein C.J, et al. ⁶ American Heart Association/American Stroke Association	100	52.4	82.1	100	28.6	85.7	74.8	
Canada								
3. Teasell R, et al. ¹⁹ Heart and Stroke Foundation of Canada	83.33		80.56	78.13	37.5	100	78.07	
4. Iruthayarajah J, et al. ³² Heart and Stroke Foundation of Canada and Canadian Partnership for Stroke Recovery	55.56		8.33	64.58	12.5	0	35.99	
UK								
5. Rudd AG, et al. ²³ Intercollegiate Stroke Working Party	100	86.11	94.79	80.56	39.58	100	83.51	
Australia								
6. Stroke Foundation ³⁵ Thailand	100	69.44	75	100	60.42	75	79.98	
7. Tantirithisak T, et al. Prasat Neurological Institute, Department of Medical Services, Ministry of Public Health ³³	47.22	55.56	17.71	94.44	12.5	12.5	39.99	
8. Masakulpan P, et al. Prasat Neurological Institute, Department of Medical Services, Ministry of Public Health ³⁴	50	66.67	29.17	91.67	12.5	12.5	43.75	

%; Domain scores are calculated by adding all the points of the individual domain items and standardizing the total, as a percentage of the maximum possible score for that domain using the following formula: (Score obtained - Minimum possible score) / (Maximum possible score - Minimum possible score) x 100.

Table 2. Synthesized of high-quality guidelines recommendations for shoulder pain management (n = 5) and their comparison with guidelines from Thailand (n = 2)

Guideline recommendation scopes	1VA/DoD ³¹	2Winstein ⁶	3Teasel ¹⁹	5Rudd ²³	6Stroke Foundation ³⁵	7Tantirittisak ³³	8Masakulpan ³⁴
1. Assessment							
- Muscle tone		C ^{**}	C ^{**}				
- Pain level			C ^{**}	*		C [*]	C [*]
2. Prevention							
- Family or caregivers education; proper protection, positioning, and handling of affected arm			A [*]	*		C [*]	C [*]
- Avoidance of overhead pulley exercises		C [*]	A [*]	*		A [*]	A [*]
3. Medical treatment							
- Analgesics			C ^{**}	*			
- Botulinum toxin		A ^{**}	B ^{**}		**		
- Subacromial corticosteroid injection		B ^{**}	B ^{**}	*	**		
- Suprascapular nerve block		B ^{**}			**		
4. Physical therapy treatment							
- Active exercise			B [*]		*	A [*]	B ^{**}
- Taping or strapping			A ^{**}		**	A [?]	
- Patient and family education		C [*]			*		
5. Shoulder subluxation							
- Positioning		C ^{**}			*	C [*]	C [*]
- Supportive devices and slings		C ^{**}			*	B ^{**}	B ^{**}
- Electrical stimulation; FES and NMES	**	A ^{**}			**	A ^{**}	A ^{**}

A strong, B moderate, C low, ^{*}very recommendable, ^{**}moderately recommendable, [?]not recommendable, [?]controversial (neither recommended nor disapproved)
 FES, functional electrical stimulation; NMES, neuromuscular electrical stimulation.

the synthesized recommendations for the management of shoulder pain in stroke patients are shown in Table 2. A clinical assessment should evaluate muscle tone and level of pain.^{6,19,23} The prevention of shoulder pain should focus on the family and caregiver education related to the proper protection, positioning, and handling of the affected arm, for instance, careful positioning and helping to support the affected arm during moves such as transferring the patient and avoiding pulling on the hemiplegic arm. Moreover, patients should avoid overhead pulley exercises.^{6,19,23} In terms of medical treatment, patients can be offered analgesics,^{19,23} botulinum toxin for those with shoulder pain caused by the spasticity of the muscles surrounding the shoulder joint,^{6,19,35} subacromial corticosteroid injections in cases of injury or inflammation in the subacromial region (e.g., rotator cuff or bursa injury),^{6,19,23,35} and suprascapular nerve block.^{6,35} Physical therapy treatment is recommended via active exercise,^{19,35} taping or strapping,^{19,35} and patient and family education regarding ROM exercise and positioning is also advised.^{6,35} Shoulder subluxation should be treated using advice for proper positioning,^{6,35} supportive devices and slings,^{6,35} and electrical stimulation (ES) via either functional electrical stimulation (FES) or neuromuscular electrical stimulation (NMES).^{6,31,35}

Discussion

The evaluation of the methodology quality of the 8 selected CPGs found that 5 of them were of a high quality and the other 3 had scores less than 60% in AGREE-II domain 1, 3, and 6. Among the selected CPGs, the highest total mean domain score was 83.51% corresponding to the United Kingdom study,²³ meanwhile the study from Canada had the lowest total mean domain score of 35.99%.³² Clarity and presentation had the highest mean domain score (90.97%), and applicability yielded the lowest one (27.53%). For both Thai CPGs, the total mean domain score was about 40%. There was only 1 domain higher than 60% (clarity and presentation). Therefore, the future Thai CPGs should pay closer attention to the other 5 domains, especially rigor of development, applicability, and editorial independence in order to improve their quality. After synthesizing the contents of the 5 high-quality CPGs, 14 recommendations for the management of shoulder pain in persons with stroke were found consistently between them. Therefore, the adherence to these recommendations by treatment or multidisciplinary teams would constitute a primary quality assurance for the care standard of shoulder pain in stroke patients. In addition, the upcoming Thai guidelines for the management of HSP after stroke should include a recommendation to persistently inquire about shoulder pain in stroke patients with upper limb weakness as well as to perform pain measurement and monitor the severity of the pain using precise instruments. Other treatment approaches that Thai guidelines should consider for the treatment of patients with HSP include analgesics, pain neuromodulation, botulinum toxin, subacromial corticosteroid injections,

suprascapular nerve block or surgical tenotomy, and NMES to maximize the potential of achieving the best outcome in these patients.

Assessment

Three of the 5 high-quality guidelines shared the same recommendations for the assessment of shoulder pain; they included muscle tone^{6,19} and pain level assessment.^{6,23} Moreover, other guidelines recommended that the severity of shoulder pain should be monitored regularly using a validated pain assessment tool, and the impact of pain on physical and psychological health should also be assessed.^{19,23} Besides, changes in the length of soft tissues and the alignment of shoulder girdle joints,^{19,33,34} active movement, trunk posture,¹⁹ and sensation should be assessed,^{6,33,34} and any possible shoulder subluxation should be identified.^{6,33,34} In addition, ultrasound may be considered as a diagnostic tool for soft tissue injury in HSP.^{6,33,34}

Prevention

Three high-quality guidelines reported the same recommendations regarding the prevention of HSP, i.e., providing relevant education to family members and caregivers and avoiding overhead pulley exercises.^{6,19,23} Hence, healthcare staff, patients, family members, and caregivers should be educated adequately on how to properly protect, position, and handle the affected arm—for instance, while transferring the patient from wheelchair to bed and vice versa and the need to avoid pulling on the hemiplegic arm.^{19,23,33}

Medical treatment

Four of the 5 high-quality guidelines recommended the use of medical treatment for HSP consisting of analgesics,^{19,23} botulinum toxin,^{6,19,35} subacromial corticosteroids injections,^{6,19,23,35} and suprascapular nerve block.^{6,23} Analgesics, such as ibuprofen or narcotics, can be used regularly simply to reduce HSP-related pain without any contraindications.^{19,23,26} Botulinum toxin injections are beneficial for pain relief in persons with HSP related to upper extremity spasticity involving muscles such as the pectoralis and subscapularis.^{6,19,26,32,35,36} It has been reported that high doses (500U) of botulinum toxin are required to improve pain and ROM.¹² Furthermore, subacromial corticosteroid injections may be used in cases of injury or inflammation of the subacromial area such as the rotator cuff or bursa.^{19,23,26,32,35} However, suprascapular nerve block injections, e.g., using methylprednisolone and bupivacaine, may be used as an adjunctive intervention to reduce shoulder pain.^{6,12,32,35}

Physical therapy treatment

The recommendations of 3 from the 5 high-quality guidelines consisted of physical therapy treatment involving active exercise,^{19,35} taping or strapping,^{19,35} and providing advice and education to patients and their family members.^{6,35} Active ROM exercises should be implemented gradually, along

with alignment restoration and exercises to strengthen weak muscles around the shoulder girdle in order to improve limb function.^{19,26,33-35} Aggressive ROM exercises, such as those involving overhead pulleys, increase HSP compared to those that do not employ pulley exercises.^{12,33,34} Therefore, the use of overhead pulley exercises should not be used in stroke patients.^{6,19,23,26,32-34} Moreover, taping or strapping the hemiplegic shoulder can be used to relieve pain^{12,19,32,35} and prevent the incidence of shoulder pain.³⁴ Patient and family education regarding ROM exercises, shoulder positioning, and proper patient transfer,^{6,34,35} especially before discharge or transitions in care, is recommended for HSP treatment following a stroke.⁶

Shoulder subluxation

Three of the 5 high-quality guidelines gave consistent recommendations about shoulder subluxation management consisting of positioning,^{6,35} supportive devices and slings,^{6,35} and ES.^{6,31,35} Both positioning and correct manual handling of the hemiplegic shoulder have been identified as strong recommendations to prevent and minimize shoulder subluxation. For example, when the patient is in the upright position such as sitting or standing, hemiplegic arm should be supported with pillows or slings, movements that can cause injury to the affected arm, e.g., excessive ROM, should be avoided, as should shoulder movements of more than 90 degrees during shoulder flexion or abduction, unless the scapula is upwardly rotated and the humeral head is in external rotation, and pulling on the affected arm when transferring the patient.^{6,33-35} In addition, a suitable sling can be used to reduce shoulder subluxation^{33,34} both at rest^{6,12,36} or when standing or walking.³⁵ Moreover, firm support devices such as a lap-tray may be used for the management of shoulder subluxation.^{6,35,36} ES, such as FES or NMES, may be also used to prevent or diminish shoulder subluxation; stimulation at the supraspinatus, posterior deltoid, and long head of biceps muscles is recommendation,^{6,31,33-35} particularly in the first six months following a stroke.³⁵

There are some limitations to this systematic review. Firstly, the CPGs involved came only from certain countries; thus, the study sample may not cover all the regions around the world. Secondly, AGREE-II is an assessment tool that focuses on the CPG development process, but it does not assess the content of the CPG recommendations.²⁹

Conclusions

Five of the 8 selected CPGs were determined to be high-quality guidelines. Five scopes of consistent recommendations for HSP management in stroke patients were identified—assessment, prevention, medical treatment, physical therapy treatment, and management of shoulder subluxation. However, for the development of up-to-date CPGs in the future, all domains of the AGREE-II should be considered in order to improve the quality of guidelines.

Disclosure

The authors declare that they have no conflict of interest regarding the publication of this review article.

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Appendix

Appendix 1. PICAR framework for guideline-specific criteria.

	Guideline-specific criteria
Population and clinical condition	- Adult (≥ 18 years) stroke patients who had shoulder pain, excluding transient ischemic attack
Interventions	- Any interventions
Comparators	- Any comparators
Attributes of eligible CPGs	- Language: Available in English or Thai - Year: Published from 1 January, 2016 to 23 February, 2021 - Publishing region: North America, Europe, Oceania (Australia and New Zealand), and Asia (China, Japan, Korea, and Thailand) - Version: Latest version only - Development: A government or private health profession association - System of rating evidence: Systematic literature review and containing recommendations, methods, or information to guide decisions related to the appropriate management of shoulder pain in stroke patients - Scope: National or international guidelines in the management of shoulder pain in patients with stroke - Recommendations: At least one recommendation regarding the management of shoulder pain in stroke patients - Minimum quality score: A score of $\geq 60\%$ in AGREE-II domains 1, 3, and 6
Recommendation characteristics	- Any recommendations for the management of shoulder pain in patients with stroke

PICAR, Population and Clinical Areas, Interventions, Comparators, Attributes of CPGs, and Recommendation characteristics

Appendix 2. Level of evidence of guideline recommendations.

Level of Evidence	Type of Study	Level of Confidence
A	Systematic review Meta-analysis	Strong
B	Randomized clinical trial Non-randomized clinical trial	Moderate
C	Case studies Opinion of expert committee	Low

Appendix 3. The degree of guideline recommendations according to the Oxford Center for Evidence-based Medicine Levels of Evidence.

Grade of Recommendation	Meaning
*	Very recommendable
**	Moderately recommendable
X	Not recommended
?	Controversial (neither recommended nor disapproved)

Appendix 4. Characteristics of included guidelines (n = 8)

	Guideline authors/organization/society	Guideline name(s)	Year of publication	Type of stroke
	USA			
1	U.S. Department of Veterans Affairs and U.S. Department of Defense (VA/DoD) ³¹ Winstein CJ, et al. ⁶	VA/DoD clinical practice guideline for the management of stroke rehabilitation Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association	2019 2016	All All
2	American Heart Association/American Stroke Association			
	Canada			
3	Teasell R, et al. ¹⁹ Heart and Stroke Foundation of Canada	Canadian stroke best practice recommendations: rehabilitation, recovery, and community participation following stroke. Part one: rehabilitation and recovery following stroke; Updated 2019	2020	All
4	Iruthayarajah J, et al. ³² Heart and Stroke Foundation, Canadian Partnership for Stroke Recovery	Evidence-based review of stroke rehabilitation	2018	All
	UK			
5	Rudd AG, et al. ²³ Intercollegiate Stroke Working Party	National clinical guideline for stroke: 5 th edition	2016	All
	Australia			
6	Stroke Foundation ³⁵	Clinical guidelines for stroke management	2017	All
	Thailand			
7	Tantiritthisak T, et al. ³³ Prasat Neurological Institute, Department of Medical Services, Ministry of Public Health Masakunpan P, et al. ³⁴	Clinical practice guidelines for ischemic stroke	2019	Ischemic stroke
8	Prasat Neurological Institute, Department of Medical Services, Ministry of Public Health	Clinical practice guidelines for stroke rehabilitation	2016	All