National Institute for Health and Care Excellence

Final

Stroke rehabilitation in adults (update)

[C] Evidence reviews for the clinical and cost-effectiveness of routine specialist orthoptist assessment

NICE guideline NG236

Evidence reviews underpinning recommendations 1.8.1 and 1.8.2 in the NICE guideline

October 2023

Final

These evidence reviews were developed by NICE

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1.1 Review question

What is the clinical and cost effectiveness of routine specialist orthoptist assessment for people after stroke?

1.1.1 Introduction

Visual function problems after stroke are common, affecting about 73% of people. Stroke can affect central and/or peripheral vision, eye movements and processing of visual information. Presence of a visual problem is often not obviously apparent and is frequently termed a hidden disability. However, it can impact significantly on general rehabilitation, activities of daily living and leads to reduced quality of life, mood changes and depression. There is a wide range of management options for the varied visual problems that occur after stroke. Hence, early detection of visual problems with appropriate planning for their management is important.

Currently, provision of eye care on stroke units in the UK is non-standardised and ad hoc. Visual problems can be missed as people after stroke may not, themselves, realise that problems are present and stroke clinicians do not necessarily have the skills to determine whether visual problems are present. Access to orthoptists on stroke units has been proposed to improve detection of visual problems after stroke, leading to quicker access to management for these problems. Therefore, this review investigates whether routine specialist vision assessment conducted by an orthoptist for people after stroke leads to better outcomes for stroke survivors.

1.1.2 Summary of the protocol

Table 1: PICO characteristics of review question

Population	Inclusion: • Adults (age ≥16 years) who have had a first or recurrent stroke (including people after subarachnoid haemorrhage) Exclusion: • Children (age <16 years) • People who have had a transient ischaemic attack
Intervention	• Routine orthoptist/eye clinic assessment (full assessment after stroke)
Comparisons	• Assessment by healthcare professionals using a screening tool (for example: VISA) • Usual care • No treatment These comparators will be reported as separate comparisons in the analysis. Confounding factors: • Age • Severity of stroke
Outcomes	At time period:

	• <6 months • ≥6 months • Person/participant generic health-related quality of life (continuous outcomes will be prioritised [validated measures]) • Carer generic health-related quality of life (continuous outcomes will be prioritised [validated measures]) • Delayed diagnosis (dichotomous outcome) • Vision-related quality of life (continuous outcomes will be prioritised) • Additional health care contacts (dichotomous outcome) • Hospitalisation (dichotomous outcome) • Activities of daily living (continuous outcomes will be prioritised) • Stroke-specific Patient-Reported Outcome Measures (continuous outcomes will be prioritised)
Study design	• Systematic reviews of RCTs • Parallel RCTs If insufficient RCT evidence is available, non-randomised studies will be considered (if they adjust for confounding variables listed above), including: 1. Prospective and retrospective cohort studies 2. Case control trials (if there are no cohort studies)

For full details see the review protocol in Appendix A.

1.1.3 Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in Appendix A and the methods document.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

1.1.4 Effectiveness evidence

1.1.4.1 Included studies

No relevant clinical studies comparing vision assessment by an orthoptist with vision assessment by any other healthcare professional were identified.

See also the study selection flow chart in Appendix C.

1.1.4.2 Excluded studies

See the excluded studies list in Appendix J.

Studies were excluded in the majority of cases as studies were not designed to investigate the review question. The question for this review considers the effectiveness of the full assessment by an orthoptist. Some studies investigated the diagnostic accuracy of orthoptic screening tools in comparison to full assessment by an orthoptist. The studies identified did not investigate the effectiveness of the orthoptic assessment and instead compared other tools to the orthoptic assessment, using orthoptic assessment as the reference standard. Due to the nature of these studies, they did not report the outcomes listed in the protocol and so were excluded from the review.

1.1.5 Summary of studies included in the effectiveness evidence

No studies were included in this review.

1.1.6 Summary of the effectiveness evidence

No studies were included in this review.

1.1.7 Economic evidence

1.1.7.1 Included studies

No health economic studies were included.

1.1.7.2 Excluded studies

No relevant health economic studies were excluded due to assessment of limited applicability or methodological limitations.

See also the health economic study selection flow chart in Appendix G

1.1.8 Summary of included economic evidence

There are no included health economic studies in this review.

1.1.9 Economic model

This area was not prioritised for new cost-effectiveness analysis.

1.1.10 Unit costs

In CG162 it was recommended that vision be assessed alongside cognition, hearing, tone, strength sensation and balance in all people who have a stroke. Currently vision assessment would usually be done as part of a joint assessment from a non-specialist in the rehabilitation team (such as an OT) who would then refer people for a full orthoptist assessment if vision problems were identified. A formal screening tool may be used (for example: the VISA tool[17]) although it is thought that a more limited assessment is more common practice currently. The alternative being considered in this review is routine full orthoptist assessment for all people who have had a stroke. Table 2 summarises these different vision assessments. Note that full orthoptist assessment involves use of specialist equipment not used in a vision screen and for those where vision problems are identified would include a diagnosis and management plan.

Table 2: Vision assessment

Rehabilitation team non-specialist vision assessment		**Full orthoptist assessment**	
Common practice - limited assessment	**Vision screening (e.g. using VISA tool)**	**On acute stroke ward**	**Eye clinic**
Case history / observations Visual field Visual neglect >>Refer for full orthoptist assessment if vision problems identified	Case history / observations Visual acuity Eye alignment / movements Visual field Visual neglect >>Refer for full orthoptist assessment if vision problems identified	Case history / observations Visual acuity Eye alignment / movements Visual field Visual neglect Reading Functional vision Binocular vision >>Diagnosis and management plan if vision problems identified	Case history / observations Visual acuity Eye alignment / movements Visual field - perimetry Visual neglect Reading Functional vision Binocular vision Quality of life questionnaire >>Diagnosis and management plan if vision problems identified

Full orthoptic assessment on the stroke ward is considered to take either the same time (complex cases) or less (mild/normal cases) as screening by non-specialists, with assessments typically taking 10-30 minutes per person. More limited non-specialist vision assessment may take less time as less aspects of vision are assessed. Orthoptists that do vision assessments on the stroke unit will usually be the same salary band (6/7) as the non-specialist member of the rehab team undertaking the vision screening (see Error! Reference source not found.3).

However, if people are screened by non-specialists, people who are identified as having vision problems will then also need to have a full orthoptic assessment to confirm the vision problem, make a diagnosis and make a management plan. Screening by a member of the rehab team prior to referral for full orthoptist assessment would not reduce the time needed for the full orthoptist assessment as all assessments would still be done.

Given these considerations, overall staff time costs associated with routine orthoptist assessment on the stroke ward should be lower compared to routine vision screening by a member of the rehab team combined with selective referral for orthoptist assessment. This may also be the case compared to more limited non-specialist vision assessment but is less clear cut as the initial assessment is likely to take less time.

In addition, if referral for orthoptist assessment currently requires people to attend an eye clinic away from the stroke ward, they may need to be accompanied by a staff member and so there would be time savings if routine orthoptist assessment takes place on the stroke ward.

Table 3: Unit costs of hospital-based staff time providing vision assessments for people following a stroke

Resource	Cost per working hour[(a)]	Illustrative time taken for vision screening/ assessment		Source
		10 minutes	30 minutes	
Band 6/7 PT/OT/orthoptist	£52 / £62	£8.67 / £10.33	£26 / £31	PSSRU 20201. Orthoptist salary was assumed to be similar to other allied HCPs[(b)]

Abbreviations: PT = physiotherapist; OT = occupational therapist; HCP = Healthcare professionals

(a) Note: Costs per working hour include salary, salary oncosts, overheads (management and other non-care staff costs including administration and estates staff), capital overheads and qualification costs.

(b) Same assumption was used in previous version of guideline (GC162)11 based on typical salary band identified by clinical GDG.

Equipment required for non-specialist vision screening is low cost. For example, the VISA tool can be downloaded for free, and the equipment required for the assessment can be purchased for £10 and used for multiple assessments. There may be some costs associated with printing the questionnaire. No equipment is required for a more limited non-specialist vision assessment.

Orthoptic assessment will involve use of equipment that is not used in vision screening (although it will already be required for those that are referred for orthoptic assessment following vision screening). Equipment needed for an orthoptist assessment in a stroke ward is estimated to cost around £2,500 (see Table 4 for a cost breakdown). This equipment typically lasts for 20 to 30 years and so will be used for many assessments and so the cost per use will be low. If the orthoptist assessment is undertaken in an eye clinic it would be typical for visual field to be assessed using a perimeter, which typically costs around £35,000. However, every eye clinic would have this type of machine already as they are used assess many eye conditions.

Table 4: Example orthoptist assessment equipment costs

Resource	Cost	Source[(a)]
Equipment pack	£10	University of Liverpool VISION research unit [20]
Visual acuity		
logMAR crowded flip	£450	HSUK4
Vocational near	£25.50	HSUK9
Cardiff cards	£682	Kays pictures10
Eye alignment / movements		
Prism bars	£520	HSUK3, [5, 7]
Occluder	£6.95	
Fixation bar	£3.95	
Reading. Options include either:		
Radner test	£101[(b)]	Precision Vision14, [15]
iReST test	£44[(b)]	
For eye clinic assessments only:		
Binocular vision		
Bagolini glasses	£130	HSUK2, [8]
Stereotest	£190	
Visual fields – perimetry in out-patient clinic. Options include either:		
Octopus 900	£35,000 (approximately)	HSUK6
Humphrey 850		Zeiss21

(a) Costs for these items were not identified in the NHS supply chain catalogue and so manufacturer costs have been used.
(b) Converted from 2019 US Dollars to 2019 UK pounds (£) [13]

Other differences in resource use could also potentially occur:

- There may be a reduction in costs associated with training non-specialist rehab team members in vision screening. Some orthoptists do provide training, but it is generally ad hoc and not routine in the NHS – usually band 7 giving a 1-hour training session every 6 months. However, some of the newer vision screening methods have been designed to be stand-alone with built-in instructions and training manuals. This was done deliberately to offset against services who do not have access to orthoptic training.

- If more vision problems are identified (screening relies on what can be observed or what the patient communicates, whereas full orthoptic assessment does not only rely on this) downstream management costs may increase. However, management may just involve information and advice at the time of the assessment on strategies to adapt to changes in vision and visual field and only some people will require further follow-up or referral, for example if glasses are needed the individual would be sent to the opticians.

- There could potentially be cost savings downstream if better and earlier identification, and so management, of vision problems allows more people to better engage in rehabilitation and so reduce disability, or if better management of vision problems helps avoid falls and people driving when visually impaired that could result in accidents.

1.1.11 Evidence statements

Effectiveness/Qualitative

Economic

No relevant economic evaluations were identified.

1.1.12 The committee's discussion and interpretation of the evidence

1.1.12.1. The outcomes that matter most

The committee included the following outcomes: person/participant generic health-related quality of life, carer generic health-related quality of life, delayed diagnosis, vision-related quality of life, additional health care contacts, hospitalisation, activities of daily living and stroke-specific Patient-Reported Outcome Measures. All outcomes were considered equally important for decision making and therefore have all been rated as critical. The committee chose to investigate these outcomes at less than 6 months and greater than and equal to 6 months, as they considered that there could be a difference in the short-term and long-term effects of the intervention.

No evidence was identified fulfilling the protocol for this review and so no outcome evidence was available.

1.1.12.2 The quality of the evidence

No clinical evidence was identified for this review.

1.1.12.3 Benefits and harms

In most stroke units in the UK identification of visual problems is based on the initial examination by a physician, and a further assessment before discharge by a specialist nurse or occupational therapist using a general screening method which would typically consider gross visual field defects and visual neglect. On a minority of stroke units formal vision screening may be done using a specific vision screening tool or comprehensive vision assessment is done by an orthoptist who can also check functional visual parameters and make a more thorough examination of visual fields. No evidence was identified to demonstrate the clinical effectiveness of specialist orthoptist assessment for people after stroke compared to screening by another healthcare professional. Therefore, the committee relied on the expert knowledge of the committee, in particular the co-opted orthoptist on the committee who had conducted a significant amount of research in the area. The committee considered their knowledge of evidence outside that specified in the protocol, which was not formally assessed for this review. This included diagnostic accuracy studies and epidemiological studies.

When considering epidemiological studies, the committee reflected that the prevalence of vision problems after stroke were very high[16, 19]. In people with recent strokes, there is a 73% prevalence of visual problems, central visual problems in 56.4%, eye movement disorders in 40.1%, visual field loss in 27.6%, , visual inattention in 27% and visual perception problems in 5.2%[18]. The committee agreed that it was important to correctly identify these problems when they occur due to the impact that can have on a person's quality of life, on their ability to engage with other therapy and the potential safety consequences for other activities (for example driving).

The committee considered that these problems are often missed in routine clinical assessment. The screening examination does not assess all parts of vision to the extent that an orthoptist using specialist equipment can (for example: this assessment will likely not

include an assessment of visual acuity, it may not assess visual perceptual disorders completely). It is likely that an orthoptist doing a specialist assessment will be able to find problems that someone without that experience will miss. Furthermore, the committee's knowledge of diagnostic accuracy studies suggested that they indicated that methods of screening are not as accurate as a specialist orthoptist assessment, with lower specificity and reduced agreement for screening of specific areas of vision assessment, such as eye movement and near visual acuity[17].

In clinical practice, when a person is screened and found to have vision problems, they would then be referred to a vision clinic to be seen by an orthoptist. Therefore, involving an orthoptist at an earlier stage may mean that problems are identified and managed earlier. Qualitative evidence has been reported to show that delayed diagnosis has an important impact on people's quality of life and so being able to do this may be important for people after a stroke. Identifying problems earlier will also prevent long term complications and so the combination of both factors may reduce downstream healthcare needs.

Given the nature of the benefits that can be gained from specialist orthoptist assessment, balanced against the resource impact and economic considerations, the committee used their expert opinion, supported by their knowledge of evidence not included in this review, to agree recommending a specialist orthoptic assessment as soon as possible after stroke. Where this is not possible, the committee agreed that referral should be made to see a specialist as an outpatient as soon as possible after leaving hospital, noting that there may be circumstances where people may wish to leave hospital before an assessment is possible (for example: early supported discharge).

1.1.12.4 Cost effectiveness and resource use

No economic evidence was identified that compared routine vision assessments by an orthoptist to an initial visual screen followed by selective assessments. Therefore, the committee were presented with different types of vision assessment that are currently being provided in clinical practice and the associated costs required for each assessment.

The most commonly provided vision assessment across stroke units is quite a limited assessment that considers an individual's case history and general observations, as well as assessing for visual field and visual neglect and is delivered by a member of the rehabilitation team. The second option is a more comprehensive vision screening is that sometimes delivered by the rehabilitation team, such as the Vision Screening Assessment (VISA) tool.[17] The vision screen covers everything included as part of the first assessment but also assesses for problems related to visual acuity and eye alignment or movements. In both cases where a vision assessment is delivered by a member of the rehabilitation team, any vision problems that are identified are referred for a full assessment by an orthoptist, which can be carried out on the stroke ward or at an eye clinic. This is considered to be a specialist assessment, which involves the use of equipment not used in the vision screen and is also where the detection of a visual impairment is followed by a formal diagnosis and management plan.

Staff time varies across the different assessments: a full orthoptic assessment on the stroke ward is considered to take either the same time (in more complex cases) or less (for mild/normal cases) as screening provided by non-specialists, with assessments typically taking 10-30 minutes per person. Orthoptists that do vision assessments on the stroke unit will usually be the same salary band (6/7) as the non-specialist member of the rehabilitation team undertaking the vision screening. The only area that typically takes longer when orthoptists are involved is the perimetry assessment which is done at the eye clinic and takes 10 minutes to complete if it is done with both eyes (25 minutes for doing each eye separately). The choice of which is done depends on the ability of the patient, but each eye

separately is an orthoptists first preference. All other assessments take similar times for orthoptists whether on the stroke unit or at an eye clinic. Only in cases where extra testing is provided (because of clinical indication or access to alternative tests) is when eye clinic assessments would take longer. The more limited non-specialist vision assessment takes less time as less aspects of vision are assessed. If people are screened by non-specialists, those who are identified as having vision problems will then also need to have a full orthoptic assessment to confirm the vision problem, receive a diagnosis and then have a management plan designed. Screening by a member of the rehabilitation team prior to referral for full orthoptist assessment would therefore not reduce the time needed for the full orthoptist assessment as all assessments would still be done.

In summary, overall staff time costs associated with routine orthoptist assessment on the stroke ward should be lower compared to routine vision screening by a member of the rehabilitation team combined with selective referral for orthoptist assessment. Staff time with a routine orthoptist assessment may also be lower compared to a more limited non-specialist vision assessment but this is uncertain as the initial assessment is likely to take less time. In addition, if referral for orthoptist assessment currently requires people to attend an eye clinic away from the stroke ward, they may need to be accompanied by a staff member and so there would be time savings if routine orthoptist assessment takes place on the stroke ward.

Equipment requirements between the assessment options vary across current practice. The limited non-specialist assessment has no associated equipment costs, while the non-specialist vision screening (for example using VISA tool) incur lows costs as the VISA tool can be downloaded for free and the equipment package is £10 and can be used for multiple assessments. There may also be some costs associated with printing the screening tool. Orthoptic assessments involve use of equipment that is not used in vision screening (although it will already be required for those that are referred for orthoptic assessment following vision screening). Equipment needed for an orthoptist assessment in a stroke ward is estimated to cost around £2,500, however the cost per use will be low as this equipment typically lasts for 20 to 30 years and will be used for many assessments. If the orthoptist assessment is undertaken in an eye clinic it would be typical for visual field to be assessed using a perimeter, which typically costs around £35,000. However, every eye clinic would have this type of machine already as they are used to assess many eye conditions.
Other differences in resource use that could potentially occur include a reduction in costs associated with training non-specialist rehabilitation team members in vision screening. The committee noted that while some orthoptists do provide training, it is generally ad hoc and not routine in the NHS – and it is usually a band 7 giving a 1-hour training session every 6 months. However, some of the newer vision screening methods have been designed to be stand-alone with built-in instructions and training manuals, which was done deliberately to offset against services who do not have access to orthoptic training. Additionally, if more vision problems are identified as a result of providing full orthoptic assessment then downstream management costs may increase. However, management may just involve information and advice at the time of the assessment on strategies to help adapt to changes in vision, and only some people will require further follow-up or referral. For example, if glasses are needed the individual would be sent to the optometrist. There could potentially be cost savings downstream if better and earlier identification (and thus the management) of vision problems allows more people to better engage in rehabilitation and so reduce disability, or if better management of vision problems helps avoid falls and people driving when visually impaired that could result in accidents.

The committee agreed that in current practice, vision assessments are usually done as part of a joint assessment from a non-specialist in the rehabilitation team (such as an occupational therapist) who would then refer people for a full orthoptist assessment if vision problems are identified. This is in line with the previous stroke rehabilitation guideline recommendations. It was also agreed that the vision assessment commonly performed by

non-specialist rehabilitation team staff currently is the limited assessment of visual field and neglect, but that more comprehensive vision screening may be done in some units. Experiences of committee members noted that it is considered rare that stroke units would include a routine assessment for all stroke patients by an orthoptist, and that generally stroke units are supported by an orthoptic service at an eye clinic.

Routine assessment by an orthoptist would therefore be a significant change in practice. The committee also considered that vision problems are a common problem for the stroke population. There are around 100,000 new strokes each year, with research showing a prevalence of 73% for visual problems following a stroke and an annual incidence of 60%, with varying prevalence reported for specific types of visual problems. However, it was acknowledged that prevalence information for stroke-related vision loss was not systematically reviewed.

Despite these concerns, committee consensus was that routine orthoptist assessments would likely require less staff time overall. Although an orthoptist's time on stroke units will be greater, it will reduce the staff time required from the rehab team to provide the initial vision screen. This would make for an overall more efficient use of each staff member's skillset. Orthoptic assessment uses specialist equipment which can identify vision problems that are not outwardly apparent and do not rely on a person's ability to communicate their vision problems. Greater identification and management of vision problems should benefit people with stroke, and while management costs may increase as well if more vision problems are identified, the subsequent benefits to patients should not be ignored. There is also the possibility of downstream savings due to falls and driving accidents prevented as vision impairment is a significant risk factor for these events. In terms of clinical differences, no evidence was identified, but pragmatically the committee agreed it was plausible that people will receive a faster diagnosis if they are given one full assessment rather than two. Furthermore, it was noted that the Intercollegiate Stroke Working Party National Clinical Guideline for Stroke recommends that a stroke rehabilitation unit multi-disciplinary team should include orthoptists.

For these reasons, the committee made an 'offer' recommendation for all people after a stroke to receive a specialist orthoptic assessment as soon as possible after stroke.

1.1.13 Recommendations supported by this evidence review

This evidence review supports recommendations 1.8.1 and 1.8.2.

1.1.14 References

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Appendices

Appendix A – Review protocols

Review protocol for the clinical and cost effectiveness of routine specialist orthoptist assessment

ID	Field	Content
0.	PROSPERO registration number	CRD42021283312
1.	Review title	What is the clinical and cost effectiveness of routine specialist orthoptist assessment for people after stroke?
2.	Review question	2.2 What is the clinical and cost effectiveness of routine specialist orthoptist assessment for people after stroke?
3.	Objective	To determine the clinical and cost effectiveness of routine specialist orthoptist assessment compared to usual care (referral to orthoptists when a problem is detected by another healthcare professional).
4.	Searches	The following databases (from inception) will be searched: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Embase • MEDLINE • PsychINFO • CINAHL • Epistemonikas Searches will be restricted by: • English language studies • Human studies Other searches: • Inclusion lists of systematic reviews The searches may be re-run 6 weeks before the final committee meeting and further studies retrieved for inclusion if relevant. The full search strategies will be published in the final review. Medline search strategy to be quality assured using the PRESS evidence-based checklist (see methods chapter for full details).

5.	Condition or domain being studied	Adults and young people (16 or older) after a stroke
6.	Population	Inclusion: • Adults (age ≥16 years) who have had a first or recurrent stroke (including people after subarachnoid haemorrhage) Exclusion: • Children (age <16 years) • People who have had a transient ischaemic attack
7.	Intervention	• Routine orthoptist/eye clinic assessment (full assessment after stroke)
8.	Comparator/Confounding factors	• Assessment by healthcare professionals using a screening tool (for example: VISA) • Usual care • No treatment These comparators will be reported as separate comparisons in the analysis. Confounding factors: • Age • Severity of stroke
9.	Types of study to be included	• Systematic reviews of RCTs • Parallel RCTs If insufficient RCT evidence is available, non-randomised studies will be considered (if they adjust for confounding variables listed above), including: 3. Prospective and retrospective cohort studies 4. Case control trials (if there are no cohort studies) Published NMAs and IPDs will be considered for inclusion.
10.	Other exclusion criteria	• Non-English language studies • Non comparative cohort studies • Before and after studies • Crossover RCTs • Conference abstracts will be excluded as it is expected there will be sufficient full text published studies available.
11.	Context	People after a stroke who may or may not have vision problems. Ideally this would be people in the acute (<7 days) or subacute (7 days – 6 months) phase after stroke,

		but it could also include people in the chronic phase (>6 months).

12.	Primary outcomes (critical outcomes)	All outcomes are considered equally important for decision making and therefore have all been rated as critical:
		
		At time period:
		• <6 months
		• ≥6 months
		
		• Person/participant generic health-related quality of life (continuous outcomes will be prioritised [validated measures])
		  o EQ-5D
		  o SF-6D
		  o SF-36
		  o SF-12
		  o Other utility measures (AQOL, HUI, 15D, QWB)
		• Carer generic health-related quality of life (continuous outcomes will be prioritised [validated measures])
		  o EQ-5D
		  o SF-6D
		  o SF-36
		  o SF-12
		  o Other utility measures (AQOL, HUI, 15D, QWB)
		• Delayed diagnosis (dichotomous outcome)
		• Vision-related quality of life (continuous outcomes will be prioritised)
		  o Vision Function Questionnaire (VFQ25)
		• Additional health care contacts (dichotomous outcome)
		• Hospitalisation (dichotomous outcome)
		• Activities of daily living (continuous outcomes will be prioritised)
		  o Barthel Index
		  o National Institutes of Health Stroke Scale
		  o Orpington Prognostic Scale
		  o Canadian Occupational Performance Measure
		  o Extended activities of daily living
		• Stroke-specific Patient-Reported Outcome Measures (continuous outcomes will be prioritised)
		  o Stroke-Specific Quality of Life (SS-QOL)
		  o Stroke Impact Scale (SIS)
		  o Stroke-specific Sickness Impact Profile (SA-SIP30)
		  o Neuro-QOL
		  o PROMIS-10
		  o Satisfaction with International Classification of Functioning, Disability and Health – Stroke (SATIS-Stroke)

13.	Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. 10% of the abstracts will be reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. The full text of potentially eligible studies will be retrieved and will be assessed in line with the criteria outlined above. A standardised form will be used to extract data from studies (see Developing NICE guidelines: the manual section 6.4). 10% of all evidence reviews are quality assured by a senior research fellow. This includes checking: • papers were included /excluded appropriately • a sample of the data extractions • correct methods are used to synthesise data • a sample of the risk of bias assessments Disagreements between the review authors over the risk of bias in particular studies will be resolved by discussion, with involvement of a third review author where necessary. Study investigators may be contacted for missing data where time and resources allow.
14.	Risk of bias (quality) assessment	Risk of bias will be assessed using the appropriate checklist as described in Developing NICE guidelines: the manual. For Intervention reviews • Systematic reviews: Risk of Bias in Systematic Reviews (ROBIS) • Randomised Controlled Trial: Cochrane RoB (2.0) • Non randomised study, including cohort studies: Cochrane ROBINS-I • Case control study: CASP case control checklist
15.	Strategy for data synthesis	• Pairwise meta-analyses will be performed using Cochrane Review Manager (RevMan5). Fixed-effects (Mantel-Haenszel) techniques will be used to calculate risk ratios for the binary outcomes where possible. Continuous outcomes will be analysed using an inverse variance method for pooling weighted mean differences. Heterogeneity between the studies in effect measures will be assessed using the I^2 statistic and visually inspected. An I^2 value greater than 50% will be considered indicative of substantial heterogeneity. Sensitivity analyses will be conducted based on pre-specified subgroups using stratified meta-analysis to explore the heterogeneity in effect estimates. If this does not

		explain the heterogeneity, the results will be presented pooled using random-effects. • GRADEpro will be used to assess the quality of evidence for each outcome, taking into account individual study quality and the meta-analysis results. The 4 main quality elements (risk of bias, indirectness, inconsistency and imprecision) will be appraised for each outcome. Publication bias is tested for when there are more than 5 studies for an outcome. The risk of bias across all available evidence was evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group http://www.gradeworkinggroup.org/ • Where meta-analysis is not possible, data will be presented and quality assessed individually per outcome. WinBUGS will be used for network meta-analysis, if possible given the data identified.	
16.	Analysis of sub-groups	Subgroups that will be investigated if heterogeneity is present: Categories of visual impairment • Visual field loss • Eye movement problems • Central vision problems • Perceptual problems • Mixed Time after stroke at the start of the trial • Hyperacute <72 hours • Acute 72 hours – 7 days • Subacute 7 days – 6 months • Chronic >6 months Severity (as stated by category or as measured by NIHSS scale or Barthel index): • Mild (or NIHSS 1-5, Barthel index ≥15) • Moderate (or NIHSS 5-14, Barthel index 10-14) • Severe (or NIHSS 15-24, Barthel index 6-9) • Very severe (or NIHSS >25, Barthel index ≤5)	
17.	Type and method of review	☒	Intervention
		☐	Diagnostic
		☐	Prognostic
		☐	Qualitative

		☐	Epidemiologic
		☐	Service Delivery
		☐	Other (please specify)
18.	Language	English	
19.	Country	England	
20.	Anticipated or actual start date	24/02/2021	
21.	Anticipated completion date	14/12/2022	
22.	Stage of review at time of this submission	Review stage	Started / Completed
		Preliminary searches	☐ / ☐
		Piloting of the study selection process	☐ / ☐
		Formal screening of search results against eligibility criteria	☐ / ☐
		Data extraction	☐ / ☐
		Risk of bias (quality) assessment	☐ / ☐
		Data analysis	☐ / ☐
23.	Named contact	5a. Named contact National Guideline Centre 5b Named contact e-mail StrokeRehabUpdate@nice.nhs.uk 5e Organisational affiliation of the review National Institute for Health and Care Excellence (NICE) and National Guideline Centre	
24.	Review team members	From the National Guideline Centre: Bernard Higgins (Guideline lead) George Wood (Senior systematic reviewer) Madelaine Zucker (Systematic reviewer) Kate Lovibond (Health economics lead) Claire Sloan (Health economist) Joseph Runicles (Information specialist) Nancy Pursey (Senior project manager)	
25.	Funding sources/sponsor	This systematic review is being completed by the National Guideline Centre which receives funding from NICE.	
26.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any	

		potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.	
27.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: https://www.nice.org.uk/guidance/indevelopment/gid-ng10175	
28.	Other registration details	N/A	
29.	Reference/URL for published protocol	N/A	
30.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.	
31.	Keywords	Adults; Assessment; Intervention; Orthoptics; Rehabilitation; Stroke; Vision	
32.	Details of existing review of same topic by same authors	N/A	
33.	Current review status	☐	Ongoing
		☐	Completed but not published
		☒	Completed and published
		☐	Completed, published and being updated
		☐	Discontinued
34.	Additional information	N/A	
35.	Details of final publication	www.nice.org.uk	

Review protocol for health economic literature review

Review question	All questions – health economic evidence
Objectives	To identify health economic studies relevant to any of the review questions.
Search criteria	• Populations, interventions and comparators must be as specified in the clinical review protocol above. • Studies must be of a relevant health economic study design (cost–utility analysis, cost-effectiveness analysis, cost–benefit analysis, cost–consequences analysis, comparative cost analysis). • Studies must not be a letter, editorial or commentary, or a review of health economic evaluations. (Recent reviews will be ordered although not reviewed. The bibliographies will be checked for relevant studies, which will then be ordered.) • Unpublished reports will not be considered unless submitted as part of a call for evidence. • Studies must be in English.
Search strategy	A health economic study search will be undertaken using population-specific terms and a health economic study filter – see appendix B below. Databases searched: • Centre for Reviews and Dissemination NHS Economic Evaluations Database (NHS EED) – all years (closed to new records April 2015) • Centre for Reviews and Dissemination Health Technology Assessment database – all years (closed to new records March 2018) • International HTA database (INAHTA) – all years • Medline and Embase – from 2014 (due to NHS EED closure)
Review strategy	Studies not meeting any of the search criteria above will be excluded. Studies published before 2006 (including those included in the previous guideline), abstract-only studies and studies from non-OECD countries or the USA will also be excluded. Each remaining study will be assessed for applicability and methodological limitations using the NICE economic evaluation checklist which can be found in appendix H of Developing NICE guidelines: the manual (2014).[12] Studies published in 2006 or later that were included in the previous guideline will be reassessed for inclusion and may be included or selectively excluded based on their relevance to the questions covered in this update and whether more applicable evidence is also identified. **Inclusion and exclusion criteria** • If a study is rated as both 'Directly applicable' and with 'Minor limitations' then it will be included in the guideline. A health economic evidence table will be completed, and it will be included in the health economic evidence profile. • If a study is rated as either 'Not applicable' or with 'Very serious limitations' then it will usually be excluded from the guideline. If it is excluded, then a health economic evidence table will not be completed and it will not be included in the health economic evidence profile. • If a study is rated as 'Partially applicable', with 'Potentially serious limitations' or both then there is discretion over whether it should be included. **Where there is discretion** The health economist will make a decision based on the relative applicability and quality of the available evidence for that question, in discussion with the guideline committee if required. The ultimate aim is to include health economic studies that are helpful for decision-making in the context of the guideline and the current NHS setting. If several studies are considered of sufficiently high applicability and methodological quality that they could all be included, then the health economist, in

	discussion with the committee if required, may decide to include only the most applicable studies and to selectively exclude the remaining studies. All studies excluded on the basis of applicability or methodological limitations will be listed with explanation in the excluded health economic studies appendix below. The health economist will be guided by the following hierarchies. *Setting:* • UK NHS (most applicable). • OECD countries with predominantly public health insurance systems (for example, France, Germany, Sweden). • OECD countries with predominantly private health insurance systems (for example, Switzerland). • Studies set in non-OECD countries or in the USA will be excluded before being assessed for applicability and methodological limitations. *Health economic study type:* • Cost–utility analysis (most applicable). • Other type of full economic evaluation (cost–benefit analysis, cost-effectiveness analysis, cost–consequences analysis). • Comparative cost analysis. • Non-comparative cost analyses including cost-of-illness studies will be excluded before being assessed for applicability and methodological limitations. *Year of analysis:* • The more recent the study, the more applicable it will be. • Studies published in 2006 or later (including any such studies included in the previous guideline) but that depend on unit costs and resource data entirely or predominantly from before 2006 will be rated as 'Not applicable'. • Studies published before 2006 (including any such studies included in the previous guideline) will be excluded before being assessed for applicability and methodological limitations. *Quality and relevance of effectiveness data used in the health economic analysis:* • The more closely the clinical effectiveness data used in the health economic analysis match with the outcomes of the studies included in the clinical review the more useful the analysis will be for decision-making in the guideline.

Appendix B – Literature search strategies

B.1 Clinical search literature search strategy

Searches were constructed using a PICO framework where population (P) terms were combined with Intervention (I) and in some cases Comparison (C) terms. Outcomes (O) are rarely used in search strategies as these concepts may not be indexed or described in the title or abstract and are therefore difficult to retrieve. Search filters were applied to the search where appropriate.

Table 5: Database parameters, filters and limits applied

Database	Dates searched	Search filter used
Medline (OVID)	1946 – 08 January 2023	Exclusions (animal studies, letters, comments, editorials, case studies/reports) English language
Embase (OVID)	1974 – 08 January 2023	Exclusions (animal studies, letters, comments, editorials, case studies/reports, conference abstracts) English language
The Cochrane Library (Wiley)	Cochrane Reviews to 2023 Issue 1 of 12 CENTRAL to 2023 Issue 1 of 12	Exclusions (clinical trials, conference abstracts)
PsycINFO (OVID)	Inception – 08 January 2023	Exclusions (animal studies, letters, case reports) Human English language
Epistemonikos (The Epistemonikos Foundation)	Inception – 08 January 2023	Exclusions (Cochrane reviews) English language
Current Nursing and Allied Health Literature - CINAHL (EBSCO)	Inception – 08 January 2023	Human Exclusions (Medline records) English Language

Medline (Ovid) search terms

1.	exp Stroke/
2.	Stroke Rehabilitation/
3.	exp Cerebral Hemorrhage/
4.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident").ti,ab.
5.	((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)).ti,ab.
6.	"brain attack*".ti,ab.
7.	or/1-6

8.	letter/
9.	editorial/
10.	news/
11.	exp historical article/
12.	Anecdotes as Topic/
13.	comment/
14.	case report/
15.	(letter or comment*).ti.
16.	or/8-15
17.	randomized controlled trial/ or random*.ti,ab.
18.	16 not 17
19.	animals/ not humans/
20.	exp Animals, Laboratory/
21.	exp Animal Experimentation/
22.	exp Models, Animal/
23.	exp Rodentia/
24.	(rat or rats or mouse or mice or rodent*).ti.
25.	or/18-24
26.	7 not 25
27.	limit 26 to English language
28.	Orthoptics/
29.	Optometry/
30.	Ophthalmology/di [Diagnosis]
31.	ophthalmologists/
32.	optometrists/
33.	vision tests/
34.	((visual or vision or eye or eyes or eyesight or sight or ophthalm*) adj4 (screening or test* or exam* or assess*)).ti,ab.
35.	((visual or vision or eye or eyes or eyesight or sight) adj2 (clinic or clinics)).ti,ab.
36.	(optomet* or orthopt* or pleoptic*).ti,ab.
37.	or/28-36
38.	27 and 37

Embase (Ovid) search terms

1.	exp Cerebrovascular accident/
2.	exp Brain infarction/
3.	Stroke Rehabilitation/
4.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident").ti,ab.
5.	((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)).ti,ab.
6.	"brain attack*".ti,ab.
7.	Intracerebral hemorrhage/
8.	or/1-7
9.	letter.pt. or letter/
10.	note.pt.
11.	editorial.pt.

12.	case report/ or case study/
13.	(letter or comment*).ti.
14.	(conference abstract or conference paper).pt.
15.	or/9-14
16.	randomized controlled trial/ or random*.ti,ab.
17.	15 not 16
18.	animal/ not human/
19.	nonhuman/
20.	exp Animal Experiment/
21.	exp Experimental Animal/
22.	animal model/
23.	exp Rodent/
24.	(rat or rats or mouse or mice or rodent*).ti.
25.	or/17-24
26.	8 not 25
27.	limit 26 to English language
28.	orthoptics/
29.	orthoptists/
30.	optometry/
31.	optometrists/
32.	ophthalmologist/
33.	vision tests/
34.	((visual or vision or eye or eyes or eyesight or sight or ophthalm*) adj4 (screening or test* or exam* or assess*)).ti,ab.
35.	((visual or vision or eye or eyes or eyesight or sight) adj2 (clinic or clinics)).ti,ab.
36.	(optomet* or orthopt* or pleoptic*).ti,ab.
37.	or/28-36
38.	27 and 37

Cochrane Library (Wiley) search terms

#1.	MeSH descriptor: [Stroke] explode all trees
#2.	MeSH descriptor: [Stroke Rehabilitation] explode all trees
#3.	MeSH descriptor: [Cerebral Hemorrhage] explode all trees
#4.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident"):ti,ab
#5.	((cerebro* or brain or brainstem or cerebral*) near/3 (infarct* or accident*)):ti,ab
#6.	brain attack*:ti,ab
#7.	(or #1-#6)
#8.	conference:pt or (clinicaltrials or trialsearch):so
#9.	#7 not #8
#10.	MeSH descriptor: [Orthoptics] explode all trees
#11.	MeSH descriptor: [Optometry] explode all trees
#12.	MeSH descriptor: [Diagnostic Techniques, Ophthalmological] explode all trees
#13.	MeSH descriptor: [Ophthalmologists] explode all trees
#14.	MeSH descriptor: [Optometrists] explode all trees
#15.	MeSH descriptor: [Vision Tests] explode all trees

#16.	((visual or vision or eye or eyes or eyesight or sight or ophthalm*) near/4 (screening or test* or exam* or assess*)):ti,ab
#17.	((visual or vision or eye or eyes or eyesight or sight) near/2 (clinic or clinics)):ti,ab
#18.	(optomet* or orthopt* or pleoptic*):ti,ab
#19.	(or #10-#18)
#20.	#9 and #19

PsycINFO (OVID) search terms

1.	exp Stroke/
2.	exp Cerebral hemorrhage/
3.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident").ti,ab.
4.	((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)).ti,ab.
5.	"brain attack*".ti,ab.
6.	Cerebrovascular accidents/
7.	exp Brain damage/
8.	(brain adj2 injur*).ti.
9.	or/1-8
10.	Letter/
11.	Case report/
12.	exp Rodents/
13.	or/10-12
14.	9 not 13
15.	limit 14 to (human and English language)
16.	optometrists/ or optometry/
17.	ophthalmologic examination/ or ophthalmology/
18.	((visual or vision or eye or eyes or eyesight or sight or ophthalm*) adj4 (screening or test* or exam* or assess*)).ti,ab.
19.	((visual or vision or eye or eyes or eyesight or sight) adj2 (clinic or clinics)).ti,ab.
20.	(optomet* or orthopt* or pleoptic*).ti,ab.
21.	or/16-20
22.	15 and 21

Epistemonikos search terms

1.	(title:((title:(stroke OR strokes OR cva OR poststroke* OR apoplexy OR "cerebrovascular accident") OR abstract:(stroke OR strokes OR cva OR poststroke* OR apoplexy OR "cerebrovascular accident")) AND (title:(visual test OR vision test OR eye test OR sight test OR ophthalm* test OR visual exam* OR vision exam* OR eye exam* OR ophthalm* exam* OR visual assess* OR vision assess* OR eye assess* OR ophthalm* assess* OR visual clinic OR visual clinics OR vision clinic OR vision clinics OR eye clinic OR eye clinics OR sight clinic OR sight clinics OR optomet* OR orthopt* OR pleoptic*) OR abstract:(visual test OR vision test OR eye test OR sight test OR ophthalm* test OR visual exam* OR vision exam* OR eye exam* OR ophthalm* exam* OR visual assess* OR vision assess* OR eye assess* OR ophthalm* assess* OR visual clinic OR visual clinics OR vision clinic OR vision clinics OR eye clinic OR eye clinics OR sight clinic OR sight clinics OR optomet* OR orthopt* OR pleoptic*))) OR abstract:((title:(stroke OR strokes OR cva OR poststroke* OR apoplexy OR "cerebrovascular accident") OR abstract:(stroke OR strokes OR cva OR poststroke* OR apoplexy OR "cerebrovascular accident")) AND (title:(visual test OR vision test OR eye test OR sight test OR ophthalm* test OR visual exam* OR vision exam* OR eye exam* OR ophthalm* exam* OR visual assess* OR vision assess* OR eye assess* OR ophthalm* assess* OR visual clinic OR visual clinics OR vision clinic OR vision clinics

	OR eye clinic OR eye clinics OR sight clinic OR sight clinics OR optomet* OR orthopt* OR pleoptic*) OR abstract:(visual test OR vision test OR eye test OR sight test OR ophthalm* test OR visual exam* OR vision exam* OR eye exam* OR ophthalm* exam* OR visual assess* OR vision assess* OR eye assess* OR ophthalm* assess* OR visual clinic OR visual clinics OR vision clinic OR vision clinics OR eye clinic OR eye clinics OR sight clinic OR sight clinics OR optomet* OR orthopt* OR pleoptic*))))

CINAHL search terms

S1	MH Stroke OR MH Stroke Rehabilitation OR MH Cerebral Hemorrhage OR ((stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident") AND (rehab*)) OR (((cerebro* or brain or brainstem or cerebral*) n3 (infarct* or accident*))) OR "brain attack*"
S2	MH optometry
S3	MH vision tests
S4	MH ophthalmology
S5	MH ophthalmologists
S6	((visual or vision or eye or eyes or eyesight or sight or ophthalm*) n4 (screening or test* or exam* or assess*))
S7	((visual or vision or eye or eyes or eyesight or sight) n2 (clinic or clinics)
S8	(optomet* or orthopt* or pleoptic*)
S9	S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8
S10	S1 AND S9

B.2 Health Economics literature search strategy

Health economic evidence was identified by conducting searches using terms for a broad Stroke Rehabilitation population. The following databases were searched: NHS Economic Evaluation Database (NHS EED - this ceased to be updated after 31st March 2015), Health Technology Assessment database (HTA - this ceased to be updated from 31st March 2018) and The International Network of Agencies for Health Technology Assessment (INAHTA). Searches for recent evidence were run on Medline and Embase from 2014 onwards for health economics, and all years for quality-of-life studies. Additional searches were run in CINAHL and PsycInfo looking for health economic evidence.

Table 6: Database parameters, filters and limits applied

Database	Dates searched	Search filters and limits applied
Medline (OVID)	Health Economics 1 January 2014 – 08 January 2023	Health economics studies Quality of life studies Exclusions (animal studies, letters, comments, editorials, case studies/reports,) English language
	Quality of Life 1946 – 08 January 2023	
Embase (OVID)	Health Economics 1 January 2014 – 08 January 2023	Health economics studies Quality of life studies

Database	Dates searched	Search filters and limits applied
	Quality of Life 1974 – 08 January 2023	Exclusions (animal studies, letters, comments, editorials, case studies/reports, conference abstracts) English language
NHS Economic Evaluation Database (NHS EED) (Centre for Research and Dissemination - CRD)	Inception –31st March 2015	
Health Technology Assessment Database (HTA) (Centre for Research and Dissemination – CRD)	Inception – 31st March 2018	
The International Network of Agencies for Health Technology Assessment (INAHTA)	Inception - 08 January 2023	English language
Current Nursing and Allied Health Literature - CINAHL (EBSCO)	1 January 2014 – 08 January 2023	Health economics studies Exclusions (Medline records, animal studies, letters, editorials, comments, theses) Human English language
PsycINFO (OVID)	1 January 2014 – 08 January 2023	Health economics studies Exclusions (animal studies, letters, case reports) Human English language

Medline (Ovid) search terms

1.	exp Stroke/
2.	exp Cerebral Hemorrhage/
3.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident").ti,ab.
4.	((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)).ti,ab.
5.	"brain attack*".ti,ab.
6.	or/1-5
7.	letter/
8.	editorial/
9.	news/
10.	exp historical article/
11.	Anecdotes as Topic/

12.	comment/
13.	case report/
14.	(letter or comment*).ti.
15.	or/7-14
16.	randomized controlled trial/ or random*.ti,ab.
17.	15 not 16
18.	animals/ not humans/
19.	exp Animals, Laboratory/
20.	exp Animal Experimentation/
21.	exp Models, Animal/
22.	exp Rodentia/
23.	(rat or rats or mouse or mice or rodent*).ti.
24.	or/17-23
25.	6 not 24
26.	Economics/
27.	Value of life/
28.	exp "Costs and Cost Analysis"/
29.	exp Economics, Hospital/
30.	exp Economics, Medical/
31.	Economics, Nursing/
32.	Economics, Pharmaceutical/
33.	exp "Fees and Charges"/
34.	exp Budgets/
35.	budget*.ti,ab.
36.	cost*.ti.
37.	(economic* or pharmaco?economic*).ti.
38.	(price* or pricing*).ti,ab.
39.	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
40.	(financ* or fee or fees).ti,ab.
41.	(value adj2 (money or monetary)).ti,ab.
42.	or/26-41
43.	quality-adjusted life years/
44.	sickness impact profile/
45.	(quality adj2 (wellbeing or well being)).ti,ab.
46.	sickness impact profile.ti,ab.
47.	disability adjusted life.ti,ab.
48.	(qal* or qtime* or qwb* or daly*).ti,ab.
49.	(euroqol* or eq5d* or eq 5*).ti,ab.
50.	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
51.	(health utility* or utility score* or disutilit* or utility value*).ti,ab.

52.	(hui or hui1 or hui2 or hui3).ti,ab.
53.	(health* year* equivalent* or hye or hyes).ti,ab.
54.	discrete choice*.ti,ab.
55.	rosser.ti,ab.
56.	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
57.	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
58.	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
59.	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
60.	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
61.	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
62.	or/43-61
63.	25 and 42
64.	25 and 62
65.	limit 63 to English language
66.	limit 64 to English language

Embase (Ovid) search terms

1.	exp Cerebrovascular accident/
2.	exp Brain infarction/
3.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident").ti,ab.
4.	((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)).ti,ab.
5.	"brain attack*".ti,ab.
6.	Intracerebral hemorrhage/
7.	or/1-6
8.	letter.pt. or letter/
9.	note.pt.
10.	editorial.pt.
11.	case report/ or case study/
12.	(letter or comment*).ti.
13.	or/8-12
14.	randomized controlled trial/ or random*.ti,ab.
15.	13 not 14
16.	animal/ not human/
17.	nonhuman/
18.	exp Animal Experiment/
19.	exp Experimental Animal/
20.	animal model/
21.	exp Rodent/
22.	(rat or rats or mouse or mice).ti.
23.	or/15-22
24.	7 not 23
25.	health economics/

26.	exp economic evaluation/
27.	exp health care cost/
28.	exp fee/
29.	budget/
30.	funding/
31.	budget*.ti,ab.
32.	cost*.ti.
33.	(economic* or pharmaco?economic*).ti.
34.	(price* or pricing*).ti,ab.
35.	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
36.	(financ* or fee or fees).ti,ab.
37.	(value adj2 (money or monetary)).ti,ab.
38.	or/25-37
39.	quality adjusted life year/
40.	"quality of life index"/
41.	short form 12/ or short form 20/ or short form 36/ or short form 8/
42.	sickness impact profile/
43.	(quality adj2 (wellbeing or well being)).ti,ab.
44.	sickness impact profile.ti,ab.
45.	disability adjusted life.ti,ab.
46.	(qal* or qtime* or qwb* or daly*).ti,ab.
47.	(euroqol* or eq5d* or eq 5*).ti,ab.
48.	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
49.	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
50.	(hui or hui1 or hui2 or hui3).ti,ab.
51.	(health* year* equivalent* or hye or hyes).ti,ab.
52.	discrete choice*.ti,ab.
53.	rosser.ti,ab.
54.	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
55.	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
56.	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
57.	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
58.	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
59.	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
60.	or/39-59
61.	limit 24 to English language
62.	38 and 61
63.	60 and 61

NHS EED and HTA (CRD) search terms

#1.	MeSH DESCRIPTOR Stroke EXPLODE ALL TREES
#2.	MeSH DESCRIPTOR Cerebral Hemorrhage EXPLODE ALL TREES

#3.	(stroke* or cva or poststroke* or apoplexy or "cerebrovascular accident")
#4.	(((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)))
#5.	("brain attack*")
#6.	#1 OR #2 OR #3 OR #4 OR #5

INAHTA search terms

1.	(brain attack*) OR (((cerebro* or brain or brainstem or cerebral*) and (infarct* or accident*))) OR ((stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident")) OR ("Cerebral Hemorrhage"[mhe]) OR ("Stroke"[mhe])

CINAHL search terms

1.	MH "Economics+"
2.	MH "Financial Management+"
3.	MH "Financial Support+"
4.	MH "Financing, Organized+"
5.	MH "Business+"
6.	S2 OR S3 or S4 OR S5
7.	S1 not S6
8.	MH "Health Resource Allocation"
9.	MH "Health Resource Utilization"
10.	S8 OR S9
11.	S7 OR S10
12.	(cost or costs or economic* or pharmacoeconomic* or price* or pricing*) OR AB (cost or costs or economic* or pharmacoeconomic* or price* or pricing*)
13.	S11 OR S12
14.	PT editorial
15.	PT letter
16.	PT commentary
17.	S14 or S15 or S16
18.	S13 NOT S17
19.	MH "Animal Studies"
20.	(ZT "doctoral dissertation") or (ZT "masters thesis")
21.	S18 NOT (S19 OR S20)
22.	PY 2014-
23.	S21 AND S22
24.	MW Stroke or MH Cerebral Hemorrhage
25.	stroke* or cva or poststroke* or apoplexy or "cerebrovascular accident"
26.	(cerebro* OR brain OR brainstem OR cerebral*) AND (infarct* OR accident*)
27.	"brain attack*"
28.	S24 OR S25 OR S26 OR S27
29.	S23 AND S28

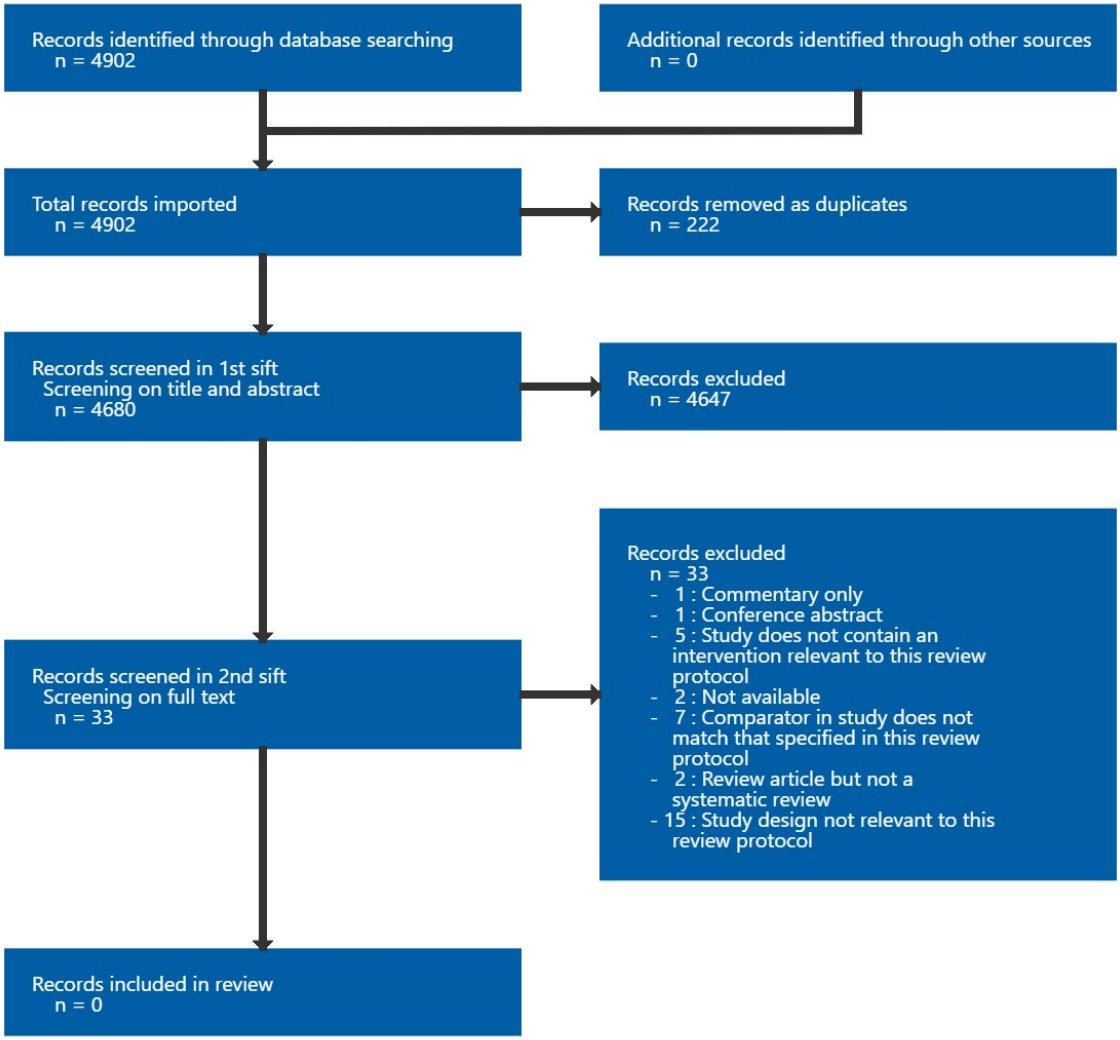
PsycINFO search terms

1.	exp Stroke/
2.	exp Cerebral hemorrhage/

3.	(stroke or strokes or cva or poststroke* or apoplexy or "cerebrovascular accident").ti,ab.
4.	((cerebro* or brain or brainstem or cerebral*) adj3 (infarct* or accident*)).ti,ab.
5.	"brain attack*".ti,ab.
6.	Cerebrovascular accidents/
7.	exp Brain damage/
8.	(brain adj2 injur*).ti.
9.	or/1-8
10.	Letter/
11.	Case report/
12.	exp Rodents/
13.	or/10-12
14.	9 not 13
15.	limit 14 to (human and english language)
16.	First posting.ps.
17.	15 and 16
18.	15 or 17
19	"costs and cost analysis"/
20.	"Cost Containment"/
21.	(economic adj2 evaluation$).ti,ab.
22.	(economic adj2 analy$).ti,ab.
23.	(economic adj2 (study or studies)).ti,ab.
24.	(cost adj2 evaluation$).ti,ab.
25.	(cost adj2 analy$).ti,ab.
26.	(cost adj2 (study or studies)).ti,ab.
27.	(cost adj2 effective$).ti,ab.
28.	(cost adj2 benefit$).ti,ab.
29.	(cost adj2 utili$).ti,ab.
30.	(cost adj2 minimi$).ti,ab.
31.	(cost adj2 consequence$).ti,ab.
32.	(cost adj2 comparison$).ti,ab.
33.	(cost adj2 identificat$).ti,ab.
34.	(pharmacoeconomic$ or pharmaco-economic$).ti,ab.
35.	or/19-34
36.	(0003-4819 or 0003-9926 or 0959-8146 or 0098-7484 or 0140-6736 or 0028-4793 or 1469-493X).is.
37.	35 not 36
38.	18 and 37

Appendix C – Effectiveness evidence study selection

Figure 1: Flow chart of clinical study selection for the review of the clinical and cost effectiveness of routine specialist orthoptist assessment



Appendix D – Effectiveness evidence

No studies were included in this review.

Appendix E – Forest plots

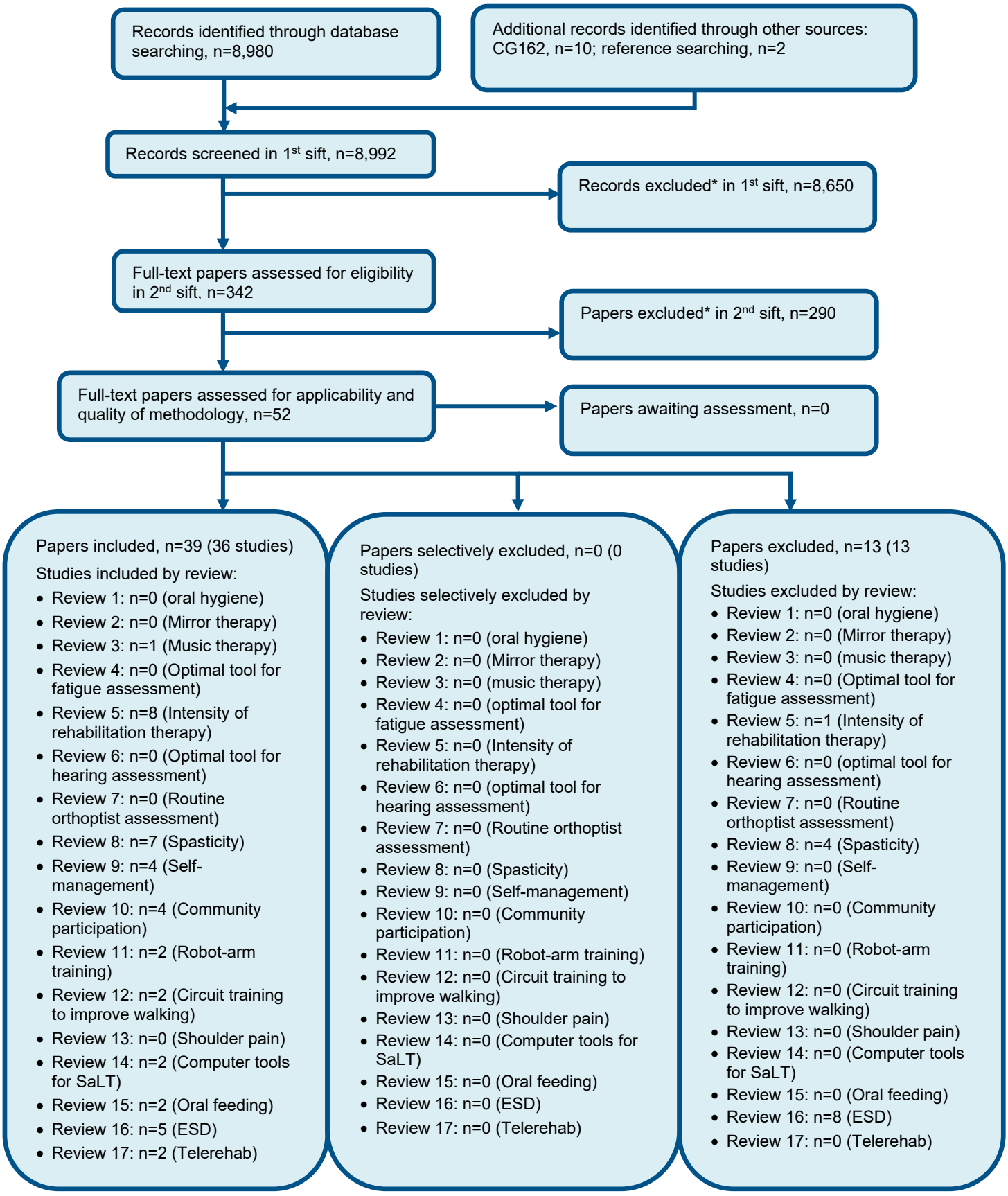
No studies were included in this review.

Appendix F – GRADE tables

No studies were included in this review.

Appendix G – Economic evidence study selection

Figure 2: Flow chart of health economic study selection for the guideline



* Non-relevant population, intervention, comparison, design or setting; non-English language

Appendix H – Economic evidence tables

There are no included health economic studies in this review.

Appendix I – Health economic model

New cost-effectiveness analysis was not conducted in this area.

Appendix J – Excluded studies

Clinical studies

Table 7: Studies excluded from the clinical review

Study	Code [Reason]
(2013) Nurses urged to detect vision problems early after acute stroke. Nursing Older People 25(9): 6-6	- Commentary only
Barer, D.; Edmans, J.; Lincoln, Nadina B. (1990) Screening for perceptual problems in acute stroke patients. Clinical Rehabilitation 4(1): 1-11	- Study does not contain an intervention relevant to this review protocol *All people were tested by an occupational therapist with two different tools*
Colwell, M. J.; Demeyere, N.; Vancleef, K. (2021) Visual perceptual deficit screening in stroke survivors: evaluation of current practice in the United Kingdom and Republic of Ireland. Disability & Rehabilitation: 1-13	- Study design not relevant to this review protocol *Survey only*
Cooke, D. M.; McKenna, K.; Fleming, J. (2005) Development of a standardized occupational therapy screening tool for visual perception in adults. Scandinavian Journal of Occupational Therapy 12(2): 59-71	- Study design not relevant to this review protocol *Review of tool validity and reliability and development of a tool*
Courtney-Harris, M. and Jolly, N. (2015) The use of a tool to detect the presence of vision defects in patients diagnosed with stroke: phase I validation of the vision screening tool. International journal of stroke 10(suppl3): 40-41	- Conference abstract
de Vries, S., Heutink, J., Melis-Dankers, B. et al. (2018) Screening of visual perceptual disorders following acquired brain injury: A Delphi study. Applied Neuropsychology: Adult 25(3): 197-209	- Study design not relevant to this review protocol *Delphi study*
Fordell, H., Bodin, K., Bucht, G. et al. (2011) A virtual reality test battery for assessment and screening of spatial neglect. Acta Neurologica Scandinavica 123(3): 167-74	- Study does not contain an intervention relevant to this review protocol *Diagnostic assessment of multiple different tools delivered by the same professional*
Hanna, K. L.; Hepworth, L. R.; Rowe, F. (2017) Screening methods for post-stroke visual impairment: a systematic review. Disability & Rehabilitation 39(25): 2531-2543	- Study does not contain an intervention relevant to this review protocol *Comparison of different screening tools for visual impairment instead of different professionals*

Study	Code [Reason]
Hanna, K. L. and Rowe, F. J. (2017) Health Inequalities Associated with Post-Stroke Visual Impairment in the United Kingdom and Ireland: A Systematic Review. Neuro-Ophthalmology 41(3): 117-136	- Study does not contain an intervention relevant to this review protocol *Investigates different health inequalities associated with visual impairment rather than the assessment of it*
Herron, S. (2016) Review of experience with a collaborative eye care clinic in inpatient stroke rehabilitation. Topics in Stroke Rehabilitation 23(1): 67-75	- Study does not contain an intervention relevant to this review protocol *A retrospective study discussing the experiences of one service where vision screening is conducted before assessment by an orthoptist*
Jones, S. A. and Shinton, R. A. (2006) Improving outcome in stroke patients with visual problems. Age & Ageing 35(6): 560-5	- Review article but not a systematic review
Lotery, A. J., Wiggam, M. I., Jackson, A. J. et al. (2000) Correctable visual impairment in stroke rehabilitation patients. Age & Ageing 29(3): 221-2	- Comparator in study does not match that specified in this review protocol *Does not compare people with full assessment to people who did not have the full assessment*
McAlpine, C. (2015) The Stroke Vision App: a Screening Tool for Visual Stroke.	- Not available
McKay, R. (2004) The effectiveness of orthoptic screening for visual defects in patients undergoing stroke rehabilitation. The transactions of the xth international orthoptic congress	- Not available
Nordfang, M., Uhre, V., Robotham, R. J. et al. (2019) A free and simple computerized screening test for visual field defects. Scandinavian Journal of Psychology 60(4): 289-294	- Comparator in study does not match that specified in this review protocol *Tests one type of visual field defect test with another rather than different professionals*
Ripley, David L., Politzer, Tom, Berryman, Amy et al. (2010) The Vision Clinic: An interdisciplinary method for assessment and treatment of visual problems after traumatic brain injury. NeuroRehabilitation 27(3): 231-235	- Study design not relevant to this review protocol *Discusses the components and processes in a vision clinic rather than investigating the effect of these*
Rowe, F. J., Conroy, E. J., Barton, P. G. et al. (2016) A Randomised Controlled Trial of Treatment for Post-Stroke Homonymous Hemianopia: Screening and Recruitment. Neuro-Ophthalmology 40(1): 1-7	- Comparator in study does not match that specified in this review protocol *Discusses comparing interventions for resolving vision problems*

Study	Code [Reason]
Rowe, F. J. and Group, V. I. S. (2011) Accuracy of referrals for visual assessment in a stroke population. Eye 25(2): 161-7	- Comparator in study does not match that specified in this review protocol *Compares the detection of signs by the multidisciplinary team and orthoptists in people who were referred by the multidisciplinary team to orthoptists rather than having different study arms that could be compared*
Rowe, F. J. and Hepworth, L. R. (2021) The Impact of Visual Impairment in Stroke (IVIS) Study - Evidence of Reproducibility. Neuro-Ophthalmology 45(3): 165-171	- Comparator in study does not match that specified in this review protocol *Compares two different strategies delivered by orthoptists*
Rowe, F. J., Hepworth, L. R., Hanna, K. L. et al. (2018) Visual Impairment Screening Assessment (VISA) tool: pilot validation. BMJ Open 8(3): e020562	- Study design not relevant to this review protocol *Diagnostic accuracy study that did not report outcomes stated in the protocol*
Rowe, F. J., Hepworth, L. R., Howard, C. et al. (2019) High incidence and prevalence of visual problems after acute stroke: An epidemiology study with implications for service delivery. PLoS ONE [Electronic Resource] 14(3): e0213035	- Comparator in study does not match that specified in this review protocol *Epidemiological study of people with had vision screened by an orthoptist and later had a full vision assessment by an orthoptist (rather than comparing the effect of other healthcare professionals)*
Rowe, F. J., Hepworth, L. R., Howard, C. et al. (2020) Impact of visual impairment following stroke (IVIS study): a prospective clinical profile of central and peripheral visual deficits, eye movement abnormalities and visual perceptual deficits. Disability & Rehabilitation: 1-15	- Study design not relevant to this review protocol *Investigates the number of vision problems in stroke admissions rather than different types of people investigating vision*
Rowe, F. J., Hepworth, L., Howard, C. et al. (2020) Vision Screening Assessment (VISA) tool: diagnostic accuracy validation of a novel screening tool in detecting visual impairment among stroke survivors. BMJ Open 10(6): e033639	- Study design not relevant to this review protocol *Diagnostic accuracy study that did not report outcomes stated in the protocol*
Rowe, F. J., Wright, D., Brand, D. et al. (2013) A prospective profile of visual field loss following stroke: prevalence, type, rehabilitation, and outcome. BioMed Research International 2013: 719096	- Study design not relevant to this review protocol *Investigates the number of people with vision problems during assessment of a number of people in hospital*

Study	Code [Reason]
Rowe, F., Brand, D., Jackson, C. A. et al. (2009) Visual impairment following stroke: do stroke patients require vision assessment?. Age & Ageing 38(2): 188-93	- Study design not relevant to this review protocol *Investigates the number of people with vision problems during assessment of a number of people in hospital*
Rowe, F. and UK, V. I. S. Group (2009) Visual perceptual consequences of stroke. Strabismus 17(1): 24-8	- Study design not relevant to this review protocol *Investigates the number of people with vision problems during assessment of a number of people in hospital*
Rowe, F. and UK, V. I. S. Group (2013) Symptoms of stroke-related visual impairment. Strabismus 21(2): 150-4	- Study design not relevant to this review protocol *Investigates the number of people with vision problems during assessment of a number of people in hospital*
Rowe, F., Wright, D., Brand, D. et al. (2011) Reading difficulty after stroke: ocular and non ocular causes. International Journal of Stroke 6(5): 404-11	- Study design not relevant to this review protocol *Investigates the number of people with vision problems during assessment of a number of people in hospital*
Rowe, Fiona J., Dent, Joseph, Allen, Frank et al. (2020) Development of V-FAST: a vision screening tool for ambulance staff. Journal of Paramedic Practice 12(8): 324-331	- Comparator in study does not match that specified in this review protocol *Compares two different tools (V-FAST and the NIHSS) instead of comparing different professionals completing assessments*
Siong, K. H., Woo, G. C., Chan, D. Y. et al. (2014) Prevalence of visual problems among stroke survivors in Hong Kong Chinese. Clinical & Experimental Optometry 97(5): 433-41	- Study design not relevant to this review protocol *Investigates the number of people with vision problems during assessment of a number of people in hospital*
Smith, K. G. and Bhutada, A. M. (2021) Detailed Vision Screening Results from a Cohort of Individuals with Aphasia. Aphasiology 35(2): 186-199	- Study design not relevant to this review protocol *Investigates the use of various vision screening tools with people with aphasia after stroke*
Stelmack, Joan (2007) Measuring outcomes of neuro-optometric care in traumatic brain injury. Journal of Behavioral Optometry 18(3): 67-71	- Review article but not a systematic review

Study	Code [Reason]
Tarbert, C. M.; Livingstone, I. A.; Weir, A. J. (2014) Assessment of visual impairment in stroke survivors. Annual International Conference Of The IEEE Engineering In Medicine And Biology Society 2014: 2185-8	- Study design not relevant to this review protocol *Narrative discussing the development of the Stroke Vision App rather than investigating this against assessment by orthoptists*

Health Economic studies

Published health economic studies that met the inclusion criteria (relevant population, comparators, economic study design, published 2006 or later and not from non-OECD country or USA) but that were excluded following appraisal of applicability and methodological quality are listed below. See the health economic protocol for more details.

Table 8: Studies excluded from the health economic review

Reference	Reason for exclusion
None.	