Vision outcome in stroke survivors

Fiona Rowe[1], VIS group UK[b]

[a] *University of Liverpool, Liverpool L69 3GB, UK*

[b] *Multi-centre UK recruiting centres*

Vision In Stroke (VIS) Group:

David Wright	Altnagelvin: Altnagelvin Hospitals HHS Trust
Darren Brand	Ayr: NHS Ayrshire and Arran
Carole Jackson	Bath: Royal United Hospitals Bath NHS Trust
Alison Price	Birmingham: Sandwell and West Birmingham NHS Trust
Linda Walker	Burnley: East Lancashire Hospitals NHS Trust
Shirley Harrison	Bury: Bury PCT
Carla Eccleston	Derby: Derby Hospitals NHS Trust
Tallat Maan	Durham: Durham and Darlington Hospitals NHS Foundation Trust
Claire Scott	Ipswich: Ipswich Hospital NHS Trust
Linda Vogwell	Gloucester: Gloucestershire Hospitals NHS Foundation Trust
Sarah Peel	Jersey: St Helier General Hospital
Leonie Robson	Lincoln: United Lincolnshire Hospitals NHS Trust
Nicola Akerman	Nottingham: University Hospital NHS Trust
Caroline Dodridge	Oxford: Oxford Radcliffe Hospitals NHS Trust
Claire Howard	Salford: Salford Primary Care Trust
Tracey Shipman	Sheffield: Sheffield Teaching Hospitals NHS Foundation Trust
Una Sperring	Swindon: Swindon and Marlborough NHS Trust
Sue Yarde	Taunton: Taunton and Somerset NHS Trust
Sonia MacDiarmid	Wigan: Wrightington, Wigan and Leigh NHS Trust
Cicely Freeman	Worcester: Worcestershire Acute Hospitals NHS Trust

Address for correspondence:

Dr Fiona Rowe

Directorate of Orthoptics and Vision Science

Thompson Yates Building

University of Liverpool

Brownlow Hill

Liverpool L69 3GB

T: 0151 7945732

F: 0151 7945781

E: rowef@liverpool.ac.uk

Aim and Objectives

The primary aim is to evaluate the effect of stroke on vision; specifically ocular perception, alignment and movement, how these impact on quality of life and the information that is required from visual assessment for the multidisciplinary team.

Methods and materials

The design of this study has been a prospective multi-centre observational case cohort trial with ethical approval. The Vision In Stroke (VIS) group consists of local investigators responsible for assessing stroke patients and collecting patient data. The data is collated centrally at the University of Liverpool. The study is being undertaken in accordance with the Tenets of Helsinki.

The target population was stroke patients suspected of having a visual difficulty. Referrals could be made from in-patient wards, rehabilitation units, community services or out-patient clinics. Patients were given an information sheet and recruited after informed, written consent. Patients were excluded if they were unable to consent, unwilling to consent, if their diagnosis was that of transient ischaemic attack or if they were discharged without vision assessment.

Patients with suspected visual difficulty are identified using a screening form. Subsequently this is used as the referral form to the Orthoptic service. A standardised investigation sheet is used for the eye assessment consisting of identification of known pre-existent ocular pathology, symptoms and signs, investigation of visual field, ocular motility and perceptual aspects. Visual fields are assessed by confrontation if the patient is seen on the ward or rehabilitation unit. When seen in clinic, quantitative measures of visual field are undertaken by Humphrey automated perimeter and Goldmann manual perimeter. Complete homonymous hemianopia was defined as loss of visual field to one side from central fixation and the vertical meridian of the field outwards. Partial homonymous hemianopia was defined as loss of visual field to one side that was incomplete with some residual vision on the affected side near the vertical meridian of the field.

Assessment of ocular alignment and motility consists of cover test, evaluation of saccadic, smooth pursuit and vergence eye movements, retinal correspondence (Bagolini glasses), fusional vergence (20D or fusional range), stereopsis (Frisby near test), prism cover test and lid and pupil function.

Perceptual deficits are recorded after questioning of the patient and/or carers and relatives. Inattention is assessed by means of a combination of assessments including line bisection, Albert's test, cancellation tests, memory tests using verbal description and drawing.

Visual acuity was assessed at near and distance fixation with Snellen or logMAR acuity tests. Low visual acuity was considered in two categories. The first defined low visual acuity as less than best corrected 6/12 Snellens acuity or 0.3 logMAR in accordance with UK driving standards[22]. The second defined low visual acuity as less than 6/18 Snellens acuity or 0.5 logMAR and equal or better than 3/60 Snellens acuity as per World Health Organisation (WHO) guidelines[23]. Additionally WHO define low vision as a corresponding visual field loss to less than 20 degrees in the best corrected eye. WHO define blindness as a visual acuity of less than 3/60 Snellens acuity or a corresponding visual field loss to less than 10 degrees in the best corrected eye.

Stroke details are recorded from patient notes accounting for stroke laterality, type and area involved. Ocular treatment details are recorded along with outcome.

Results were inputted to the statistical package SPSS version 15.

Results

Data was collected over a 3-year time period from 1st May 2006 to 30th April 2009.

General demographics

1345 patients were referred for visual assessment for this study. 915 patients were recruited and 430 patients were excluded, the latter mainly due to inability to consent. Patients were not excluded because of type or severity of stroke. An attempt was made to establish the visual status of these patients. 27% had a visual field defect documented, 20% had ocular

motility disturbance, 4% had low vision and 2% had perceptual difficulties including inattention. 15% had combinations of visual field, ocular motility, low vision and perceptual deficits.

Of 915 patients recruited, 59% were male and 41% female. Mean age at onset of stroke was 69.18 years (range 1-94: SD 14.19 years). Median duration from onset of stroke to initial eye examination was 22 days (0-2543 days), the mean of 40.84 (SD 141.28) days being skewed by three outliers (patients referred a number of years after the stroke onset). One patient had a recurrent stroke, hence their referral for new eye assessment. The other two patients were simply not referred for eye assessment when they first had their stroke. They did not have recurrent strokes and were finally referred as out-patients. Stroke lesion was right sided in 48.9% (i.e. right sided brain damage), left sided in 37.7% and bilateral in 13.4%. Infarcts accounted for 84.5%.

Cortical areas included frontal, parietal, temporal and occipital lobes, external and internal capsule, intraventricular and periventricular areas, thalamus, basal ganglia and lacunar areas. Patients who had a cortical stroke had mostly visual field loss or ocular motility abnormalities. Patients who had lesions in brain stem or cerebellar areas were most likely to demonstrate ocular motility abnormalities that any other type of ocular deficit.

8% of patients were found to have normal visual status when examined. For the remaining 92% the visual deficits documented in this study were grouped into:

1. Low vision
2. Eye movement deficit
3. Visual field impairment
4. Perceptual deficit.

Low vision

Low visual acuity of less than 6/12 or 0.3 best corrected acuity was documented in 36.4% of patients at near vision and 27.8% at distance vision. Low visual acuity of less than 6/18 or 0.5 best corrected acuity was documented in 26.6% of patients at near and in 17.6% at

distance vision. 72% required spectacles to obtain best corrected visual acuity. Ocular pathology was noted in 34.7% of patients including cataract, age related macular degeneration, diabetic retinopathy, glaucoma, myopic degeneration, amblyopia, retinal dystrophy, optic nerve disease and anoxia. Of patients with low vision of less than 6/12, 31% had low vision attributable to associated ocular pathology and not as a result of their stroke.

Eye movement deficit

54.4% of patients had an alignment or ocular motility defect confirmed on examination. 19% had manifest strabismus in primary gaze. 14.6% of patients had nystagmus. Reduced convergence at less than 10cms was recorded in 30.1% of patients. Symptoms included diplopia, oscillopsia or reading difficulty. The type of ocular motility defect was evaluated according to the stroke site. The site of lesion was cortical in 83%. 17% had lesions of the cerebellum or brainstem.

Visual field impairment

54.3% of patients had visual field impairment with complete homonymous hemianopia in 28.3%. Other types of visual field impairment included partial homonymous hemianopia, inferior or superior quadrantanopia, scotomas, altitudinal defects, macular sparing hemianopia and chequerboard defects. Visual field loss was right sided in 37.5%, left sided in 52.8% and bilateral in the remainder.

The site of stroke was cortical in 94%. 6% had lesions of the cerebellum or brainstem.

Perceptual deficit

18% of patients reported or had documented perceptual deficits. The largest group were patients with left-sided visual inattention/neglect (14%). A small number of patients had visual hallucinations (2.5%) and object agnosia (2.2%). Three patients had difficulty with depth judgement and one patient had acquired colour detection difficulties.

VIS Publications

Reference	Abstract
Rowe FJ, VIS Group. Prevalence of ocular motor cranial nerve palsies and associations following stroke. Eye (8 April 2011) doi:10.1038/eye.2011.78	Aim: The occurrence of ocular motor cranial nerve palsies (OMCNP) following stroke has not been reported in relation to the type of OMCNP seen and relation to brain area affected by stroke. The aim of this study was to identify all patients referred with suspected visual impairment to establish the presence and type of OMCNP. Methods: Prospective, observation study with standardised referral and assessment forms across 20 sites. Visual assessment included visual acuity measurement, visual field assessment, ocular alignment and movement assessment and visual inattention assessment. Multi-centre ethical approval and informed patient consent was obtained. Results: 915 patients were recruited with mean age of 69.18 years (SD 14.19). 498 patients (54%) were diagnosed with ocular motility abnormalities. Of these, 89 patients (18%) had OMCNP. Unilateral third nerve palsy was present in 23 patients (26%), fourth nerve palsy in 14 patients (16%) and sixth nerve palsy in 52 patients (58%). 44 patients had isolated OMCNP and 45 had OMCNP combined with other ocular motility abnormalities. Location of stroke was reported mainly in cerebellum, brain stem, thalamus, internal and external capsules. Treatment was provided for each case including prisms, occlusion, typoscope, scanning exercises and refraction. Conclusions: OMCNP account for 18% of eye movement abnormalities in this stroke sub-population. VI CNP were most common, followed by III and IV CNP. Half were isolated and half combined with other eye movement abnormality. Most were treated with prisms or occlusion. The reported brain area affected was typically the cerebellum, brain stem and diencephalic structures.
Rowe FJ, VIS Group. Accuracy of referrals for visual assessment in a stroke population. Eye. 2011 Feb;25(2):161-7.	Purpose: To evaluate accuracy of referrals from multidisciplinary stroke teams requesting visual assessments. Methods: Multi-centre prospective study undertaken in 20 acute Trust hospitals. Stroke survivors referred with suspected visual difficulty were recruited. Standardised screening/referral forms and investigation forms were employed to document data on referral signs and symptoms plus type and extent of visual impairment. Results: Referrals for 799 patients were reviewed: 60% males, 40% female. Mean age at onset of stroke was 69 years (SD 14: range 1-94 years). Signs recorded by referring staff were nil in 58% and positive in the remainder. Symptoms were

	recorded in 87%. Diagnosis of visual impairment was nil in 8% and positive in the remainder. Sensitivity of referrals (based on signs detected) was calculated as 0.42 with specificity of 0.52. Kappa statistical evaluation of agreement between referral and diagnosis of visual impairment was 0.428 (SE0.017: 95%CI -0.048, 0.019). Conclusions: More than half of patient referrals were made despite no signs of visual difficulty being recorded by referring staff. Visual impairment of varying severity was diagnosed in 92% of stroke survivors referred for visual assessment. Referrals were made based predominantly on visual symptoms and because of formal orthoptic liaison in Trusts involved.
Rowe FJ, VIS Group. Reading impairment following stroke: ocular and non ocular causes. International Journal of Stroke. 2011: epub ahead of print 1st March 2011	Background: Ocular causes of reading impairment following stroke include visual field loss, eye movement impairment and poor central vision. Non ocular causes may include cognitive errors or language impairment. Aim: The purpose of this study was to identify all patients referred with suspected visual impairment who had reported reading difficulty to establish the prevalence of ocular and non ocular causes. Methods: Prospective, multi-centre, observation study with standardised referral and assessment forms across 21 sites. Visual assessment included visual acuity measurement, visual field assessment, ocular alignment and movement assessment and visual inattention assessment. Multi-centre ethical approval and informed patient consent was obtained. Results: 915 patients were recruited with mean age of 69.18 years (SD 14.19). Reading difficulties were reported by 177 patients (19.3%) with reading difficulty as the only symptom in 39 patients. 15 patients had normal visual assessment but with a diagnosis of expressive or receptive aphasia. Eight patients had alexia. 109 patients had visual field loss, 85 with eye movement abnormality, 27 with low vision and 39 patients with visual perceptual impairment. 87 patients had multiple ocular diagnoses with combined visual field, eye movement, low vision or inattention problems. All patients with visual impairment were given targeted treatment and/or advice including prisms, occlusion, refraction, low vision aids and scanning exercises. Conclusions: Patients complaining of reading difficulty were mostly found to have visual impairment relating to low vision, eye movement or visual field loss. A small number were found to have non ocular causes of reading difficulty. Treatment or advice was possible for all patients with visual impairment.
Rowe FJ, VIS Group. Reading	Introduction: The purpose of this study was to

impairment following stroke. Transactions International Strabismological Association. Istanbul, Turkey. 2010; in press	identify all patients referred with suspected visual impairment who had reported reading difficulty to establish the prevalence of ocular and non ocular causes. Methods: Prospective, multi-centre, observation study. Visual assessment included visual acuity measurement, visual field assessment, ocular alignment and movement assessment and visual inattention assessment. Results: 915 patients were recruited with mean age of 69.18 years (SD 14.19). Reading difficulties were reported by 177 patients (19.3%). 15 patients had normal visual assessment but with diagnosis of aphasia. Eight patients had alexia. 109 patients had visual field loss, 85 with eye movement abnormality, 27 with low vision and 39 patients with visual perceptual impairment. 87 patients had combined visual field, eye movement, low vision or inattention problems. Conclusions: Patients complaining of reading difficulty were mostly found to have visual impairment relating to low vision, eye movement or visual field loss. Treatment or advice was possible for all patients with visual impairment.
Rowe FJ, VIS Group. Prevalence of cranial nerve palsies and associations following stroke. Transactions International Strabismological Association. Istanbul, Turkey. 2010; in press	Introduction: The purpose of this study was to identify all patients referred with suspected visual impairment to establish the presence and type of CNP. Methods: Prospective, multi-centre, observation study. Results: 915 patients were recruited with mean age of 69.18 years (SD 14.19). 498 patients (54%) were diagnosed with ocular motility abnormalities. Of these, 89 patients (18%) had CNP. Unilateral third nerve palsy was present in 23 patients (26%), fourth nerve palsy in 14 patients (16%) and sixth nerve palsy in 52 patients (58%). 44 patients had isolated CNP and the remainder had CNP combined with other ocular motility abnormalities. Location of stroke was reported mainly in cerebellum, brain stem, thalamus, internal and external capsules. Other areas involved included frontal, parietal, temporal and occipital lobes. Treatment was provided for each case including prisms, occlusion, typoscope, scanning exercises and refraction. Conclusions: CNP account for 18% of eye movement abnormalities in this sub-stroke population. VI CNP were most common.
Rowe FJ. Who sees visual impairment following stroke? Strabismus. 2010: 18; 37-40	Background/aims: The aims of this survey were to determine the extent of Orthoptic involvement in stroke services throughout the UK and what constitutes a vision assessment. Methods: A non-validated questionnaire was sent to 134 Orthoptic departments in the UK asking information on stroke services in their Trusts and provision of Orthoptic input and vision assessments in these services. Results: A return rate of 42% was achieved. 62% of

	departments were aware of adherence to the National Service Framework for Older Persons in their Trusts and its section on stroke services. 55% of Trusts with stroke services confirmed that a vision assessment was provided by either Orthoptists, occupational therapists, physicians or nurses. Only Orthoptic led screening provided quantitative assessment of visual acuity, ocular motility and visual fields. Conclusions: 45% of stroke services provided no formal vision assessment for stroke patients. Of those providing vision assessment, 15% were basic qualitative assessments.
Rowe FJ, VIS group. The profile of strabismus in stroke survivors. Eye. 2009: epub ahead of publication. 2010; 24: 682-5	Aim: To evaluate the profile of strabismus that occurs in stroke survivors and determine the relationship between site of stroke and symptom of diplopia. Methods: Prospective multi-centre cohort trial involving 16 recruiting centres (Vision in Stroke [VIS] group). Standardised referral and investigation protocol used by local investigators. Each patients underwent assessment of ocular alignment, motility and binocular vision. Results were evaluated with non parametric statistical tests. Results: 512 patients were recruited with a mean age of 69 years: SD 15 over a 2-year period (59% male, 41% female). Median duration from onset to vision assessment was 19 days (range 0 to 1140 days). 19% had strabismus detected on Orthoptic investigation after onset of stroke. Of these strabismic patients 12.5% had strabismus that pre-existed the onset of stroke (that could be determined from case history). 70% had strabismus associated with ocular motility abnormalities and 30% were in isolation. 24% were associated with brain stem, cerebellar, thalamus or basal ganglia strokes and 73% with cortical strokes. 36% complained of diplopia and the remainder had no symptoms related to their strabismus. Conclusions: Strabismus was found to occur in 16.5% of patients following their stroke. Strabismus with diplopia was always associated with other ocular motility abnormalities whereas strabismus without associated ocular motility abnormalities did not result in the symptom of diplopia.
Rowe FJ, VIS Group. Ocular motility consequences of thalamic infarcts. Trans. 33rd European Strabismological Association. Belgrade, Serbia. 2009, 2009, pp 59-62	Introduction: The profile of ocular anomalies following thalamic stroke was evaluated. Methods: Prospective multi-centre study involving 20 recruiting centres (Vision in Stroke [VIS] group) with standardised referral and investigation protocol. Results: 603 patients recruited over a 2-year period. Mean age of 69 years: SD 15 (59% male, 41% female). Median duration from onset to vision assessment was 19 days (range 0 to 1140 days). 17 patients (2.8%: 12 male, 5 female) with

	diagnosis of purely thalamic involvement from MR imaging; 14 due to infarct, 3 haemorrhage. Six were right sided, 8 left sided and 3 bilateral. Two patients (12%) had no ocular abnormalities on assessment. For the remaining 15 patients, symptoms included diplopia, blurred vision, reading difficulty, visual hallucinations and visual field loss. Signs included manifest strabismus (20%), impaired ocular movements (73%: vertical gaze palsy, IV or VI CNP, saccadic palsy or dysmetria), nystagmus (20%), reduced convergence (40%), ptosis or lid retraction (20%), pupil abnormalities (13%) and visual field loss (33%). Treatment included prisms, occlusion, orthoptic exercises, refraction, typoscope and targeted advice regarding compensatory strategies. Eight patients had review assessments at 3 months showing full recovery (1), improvement (4) or no improvement (3). Discussion: 88% of patients with thalamic stroke had ocular alignment and motility impairment and visual field loss. In view of visual impairments such as visual field loss, it is clear that the vascular pathology interrupted other anatomical areas and nerve projections other than those of the thalamus.
Rowe FJ, VIS group. Visual perceptual consequences of stroke. Strabismus 2009; 17: 24-28	Aim: To evaluate vision related perceptual consequences occurring after stroke. Methods: Prospective multi-centre cohort trial involving 14 recruiting centres (Vision in Stroke [VIS] group). Standardised referral and investigation protocol used by local investigators. Data presented from the first year of data collection: May 2006 - April 2007. Results: 178 patients excluded (49% male, 51% female) mainly due to inability to consent because of cognitive difficulties. 323 patients recruited (59% male, 41% female). Mean age at onset of stroke of 69 years (range 1-92). Median duration from onset to vision assessment of 22 days (range 0 to 2543 days). Type of stroke was infarct in 79.5% and haemorrhagic in 20.5%. 6% with previous stroke history. Laterality of stroke was right sided in 48%, left sided in 40% and bilateral in the remainder. 8% of patients had normal visual status. 68.4% had eye movement impairment, 46.1% had visual field impairment and 25.1% had low vision. 20.5% had perceptual difficulties: 14.2% had inattention, 1.3% had difficulty judging depth and distance, 0.3% had colour detection problems, 2.5% complained of hallucinations and 2.2% of agnosia. Conclusions: One fifth of patients had perceptual consequences to their stroke relating to inattention and cortical visual processing impairment.
Rowe FJ, VIS group. Visual impairment following stroke. Do stroke patients require	Objective: The purpose of this paper is to present a one-year data set and identify the types of visual impairment occurring following stroke and their

vision assessment? Age and Ageing. 2009; 38: 188-193 (November 21 advance publication) doi: 10.1093/ageing/afn230	prevalence. Materials: Multi-centre prospective observation study undertaken in 14 acute Trust hospitals. Stroke survivors with suspected visual difficulty were recruited. Standardised screening/referral forms and investigation forms were employed to document data on visual impairment specifically assessment of visual acuity, ocular pathology, eye alignment and movement, visual perception (including inattention) and visual field defects. Declaration of sources of funding; nil. Results: 323 patients were recruited with a mean age of 69 years (standard deviation SD 15. 68% had eye alignment/movement impairment, 49% had visual field impairment, 26.5% had low vision and 20.5% had perceptual difficulties. Conclusions: Of patients referred with suspected visual difficulty, only 8% had normal vision status confirmed on examination. 92% had visual impairment of some form confirmed which is considerably higher than previous publications and probably relates to the prospective, standardised investigation offered by specialist Orthoptists. However under-ascertainment of visual problems cannot be ruled out.
Rowe FJ, VIS group. The profile of strabismus in stroke survivors. Trans. 32nd European Strabismological Association. Munich, Germany. 2008, 49-52	Aim: To evaluate the profile of strabismus that occurs in stroke survivors and determine the relationship between site of stroke and symptom of diplopia. Methods: Prospective multi-centre cohort trial involving 16 recruiting centres (Vision in Stroke [VIS] group). Standardised referral and investigation protocol used by local investigators. Results: 512 patients were recruited with a mean age of 69 years: SD 15 over a 2-year period (59% male, 41% female). Median duration from onset to vision assessment was 19 days (range 0 to 1140 days). 19% had strabismus detected on Orthoptic investigation after onset of stroke. Of these strabismic patients 12.5% had strabismus that pre-existed the onset of stroke (that could be determined from case history). 70% had strabismus associated with ocular motility abnormalities and 30% were in isolation. 24% were associated with brain stem, cerebellar, thalamus or basal ganglia strokes and 73% with cortical strokes. 36% complained of diplopia and the remainder had no symptoms related to their strabismus. Conclusions: Strabismus was found to occur in 16.5% of patients following their stroke. Strabismus with diplopia was always associated with other ocular motility abnormalities whereas strabismus without associated ocular motility abnormalities did not result in the symptom of diplopia.
Rowe FJ, VIS group. Visual	Aim: Perceptual consequences of stroke include

perceptual consequences of stroke. Trans. 11th International Orthoptic Congress. 2008, Antwerp, Belgium. pp 66-69	agnosia, alexia, dyschromatopsia, inattention and hallucinations. Our aim was to evaluate these perceptual consequences in terms of prevalence after stroke. Methods: Prospective multi-centre cohort trial involving 14 recruiting centres (Vision in Stroke [VIS] group). Standardised referral and investigation protocol used by local investigators. Data presented from the first year of data collection: May 2006 - April 2007. Information obtained on visual acuity, ocular alignment and motility, visual field, visual inattention and visual cognition/perception. Results: 178 patients excluded (49% male, 51% female) mainly due to inability to consent because of cognitive difficulties. 323 patients recruited (59% male, 41% female). Mean age at onset of stroke of 69 years (range 1-92). Median duration from onset to vision assessment of 22 days (range 0 to 2543 days). Type of stroke was an infarct in 79.5% and haemorrhagic in 20.5%. 6% had had a previous stroke. Laterality of stroke was right sided in 48%, left sided in 40% and bilateral in the remainder. 8% of patients had normal visual status. 68.4% had eye movement impairment, 46.1% had visual field impairment and 25.1% had low vision. 20.5% had perceptual difficulties. Of these, 14.2% had inattention, 1.3% had difficulty judging depth and distance, 0.3% had colour detection problems, 2.5% complained of hallucinations and 2.2% of agnosia. Conclusions: A substantial proportion (92%) of patients referred with suspected visual difficulty had visual impairment. One fifth of patients referred had perceptual consequences to their stroke relating to inattention and cortical visual processing impairment.
Rowe FJ, VIS group. The spectrum of nystagmus following cerebro-vascular accident. British and Irish Orthoptic Journal. 2008; 5: 22-25	Aim: The purpose of this paper is to report the features of nystagmus documented following a confirmed diagnosis of cerebro-vascular accident (stroke). Methods: Multi-centre prospective observation study undertaken in 14 acute Trust hospitals. Stroke survivors with suspected visual difficulty were recruited. Standardised screening/referral forms and investigation forms were employed to document data on visual impairment specifically assessment of visual acuity, ocular pathology, eye alignment and movement, visual perception (including inattention) and visual field defects. Results: Of 323 patients, 38 were found to have nystagmus following cortical, brain stem or cerebellar stroke. Twenty were male and 18 female with a mean age of 65 years. Acquired nystagmus accounted for 84% of the types documented. Four patients had oscillopsia and three had vertigo. Associated ocular motility deficits were found in

	84% of patients and treatment was largely aimed at alleviating diplopia but also reading difficulties or blurred vision. Improvement was noted in 42%. Conclusions: 12% of stroke survivors with suspected visual difficulties had nystagmus documented. Most had associated ocular motility defects. Symptoms relating to the nystagmus of oscillopsia and vertigo were reported in 18%. Improvement of ocular motility was recorded in 42%.
Rowe FJ, VIS group. Visual impairment in stroke survivors: a prospective multi-centre trial. Trans. 31st European Strabismological Association, Mykonos, Greece. 2007, 185-188	Aim: To evaluate the effect of stroke on vision; specifically ocular perception, alignment and movement, how these impact on the patient's quality of life and subsequent information resource for the multidisciplinary team. Methods: Prospective multi-centre cohort trial involving 13 recruiting centres (Vision in Stroke [VIS] group). Standardised referral and investigation protocol used by local investigators. Results: 135 patients excluded (52% male, 48% female) mainly due to inability to consent because of cognitive difficulties. 243 patients recruited over a 10 month period (60% male, 40% female). Mean age at onset of stroke of 71 years (range 19-92). Median duration from onset to vision assessment of 19 days (range 0 to 1140 days). 28.6% of patients had reduced corrected visual acuity below 0.3 (6/12) for near and 31.6% for distance. 20.5% of patients had manifest strabismus in primary gaze. 61% had ocular motility abnormalities and 10% had nystagmus. 54% showed reduced convergence less than 6cms. Conclusions: A substantial proportion of patients referred with suspected visual difficulty had ocular motility or alignment defects. These were due to predominantly brainstem, parietal or occipital lobe infarcts.