Validation of a Stroke Vision-Screening Tool (S-ViST) for Australian non-eye care health practitioners

Authors: Michelle Courtney-Harris[a]*, Neryla Jolly[a], Fiona Rowe[b], Kathryn Rose[a]

[a]*Graduate School of Health, Orthoptics, University of Technology Sydney, Australia;*

[b]*Institute of Population Health, University of Liverpool, United Kingdom;*

ORCID ID:

Michelle Courtney-Harris: 0000-0002-7662-0607

Neryla Jolly N/A

Fiona Rowe: 0000-0001-9210-9131

Kathryn Rose N/A

Corresponding Author [a]*:

Graduate School of Health, Orthoptics, University of Technology Sydney

P.O. Box 123 Broadway, NSW, 2007, Australia

T:+61 02 9514 7237

E: michelle.coutney-harris@uts.edu.au

Abstract:

Purpose: To validate a vision-screening tool for use by non-eye care health practitioners (NECHP) to aid the identification of visual problems in stroke survivors.

Material and Methods: A purposely designed bedside vision-screening tool was used to assess visual function in stroke survivors. Two metropolitan Sydney (Australia) public hospital stroke units with no access to on-site eye care professionals participated in the study. Stroke survivors (n=100) admitted for ≥3 days who could provide coherent responses were randomly allocated into two groups. All were assessed by a NECHP using the vision-screening tool. In Group 1, the orthoptist also administered the vision-screening tool while in Group 2, a comprehensive orthoptic visual assessment was performed. Levels of agreement and the sensitivity and specificity for key outcomes were assessed.

Results: Levels of agreement for Group 1, reached 92%. While comparison of the screening tool to a comprehensive orthoptist assessment (Group 2), demonstrated high (100%) sensitivity and specificity for detecting pre-existing visual problems; detection of newly acquired vision problems was less with sensitivity and specificity around 66.6%.

Conclusion: The vision-screening tool is a valid instrument for the detection of vision defects in stroke survivors. By improving detection of eye conditions when used by NECHP, the tool may facilitate timely identification and management of visual conditions, potentially improving patient care and rehabilitation outcomes.

Keywords: vision-screening, stroke assessment, vision problems, rehabilitation

Validation of a vision-screening tool for use by nurses and other non-eye care health practitioners on stroke survivors.

Main Text

Background

Stroke is an ischemic or hemorrhagic vascular event that interrupts blood flow to cerebral areas causing disturbance of function, with ischemic events accounting for more than 80-85% of strokes (Feigin et al., 2003). The most common age group for stroke in Australia is >65 years, with the risk being compounded as one becomes older (Bonita et al., 1994; Feigin et al., 2014). However, stroke can affect all ages, with approximately 28% of stroke survivors aged <55 years. It is expected as the average population age increases, the prevalence of stroke will rise (Thrift et al., 2000). This will increase demand for health services to support stroke survivors and their families (Dewey et al., 2001; Rodgers et al., 2001).

Deficits to sensory and motor functions associated with stroke, can vary from subtle to debilitating, with symptomatic visual defects frequently occurring (Rowe et al., 2019). Stroke-related visual difficulties include poor visual acuity, abnormal eye movements, reduced visual fields and poor visual perception, which can impact a patient's responsiveness to the provision of care (Rowe, 2017; Shankar Shrestha et al., 2012; Wolter & Preda, 2015).

Stroke survivors generally have obvious and serious health consequences requiring immediate attention. These can affect mobility, cognition and speech that may influence levels of independence, confidence, and social interaction, impacting time in rehabilitation, rate and level of recovery and a stroke survivor's capacity to be self-sufficient (Hepworth &

Rowe, 2016; Robison et al., 2009). Stroke-related vision deficits are not always overt (Rowe et al., 2009). It is only when activities that rely on visual input are affected, that there may be a realization that visual function has been impacted. Stroke-related visual difficulties can be further complicated by a pre-existing need for glasses (Lotery et al., 2000), or ocular pathology including glaucoma, cataract (Wu et al., 2008) and aged related macular degeneration (Williams et al., 1998), which are common diagnoses in the elderly. Some eye conditions can worsen if management is interrupted or not commenced in a timely manner. Therefore, there is a need to identify both non-stroke-related ocular pathologies and those of more recent onset (Rowe, 2017). This is important not just to aid rehabilitation, but as vision impairment has been shown to be linked to poor quality of life and depression (Tsai et al., 2003), it is crucial that vision deficits are recogised and treatment of ocular pathology is undertaken to prevent any further deterioration of sight.

Currently there is no standardised visual screening tool or standardised vision assessment for stroke survivors when admitted to hospital in Australia. Visual field and visual inattention may be tested as part of a routine neurological assessment but in many hospitals, there is no on-site access to ophthalmologists and/or orthoptists, who specialize in the diagnosis and management stroke-related eye defects.

In 2008, a report (Jolly, 2008) submitted to the New South Wales (NSW) State-wide Ophthalmology Services, Agency for Clinical Innovation (ACI) stated that a significant proportion (50%) of patients with stroke admitted to NSW hospitals, failed to have many stroke-related eye conditions detected and managed during their early stages of stroke recovery. A stroke survivor was five times more likely to receive intervention and/or further referral, when assessed by an orthoptist. The report highlighted the need for education of non-eye care health practitioners (NECHP) which includes nursing staff who are a core

component to patient care, to improve awareness of eye conditions commonly seen in patients with stroke. While a signs and symptoms checklist were in existence (Rowe et al., 2009), and predominantly United Kingdom (UK) designed and implemented, it was determined that a more comprehensive vision-screening tool, suited to Australian health services was required. UK and Australian services vary, particularly in availability of eye specialist services within hospitals. A team of Australian orthoptists with stroke assessment expertise, designed a bed-side vision-screening tool to be used by nurses and other NECHP as part of a regular stroke assessment (Jolly, 2008).

The new Stroke & Vision Defect Screening Tool (SVDST) comprised a short questionnaire with an additional bed-side visual acuity (VA) screening test. The questionnaire determines the presence of existing and newly acquired visual conditions in response to targeted questions and guided observations made by members of the stroke team, including nurses. This validation study aimed to determine the sensitivity and specificity in detection of pre-existing or acquired stroke-related visual defects.

Methods

Ethical approval for this study was obtained from the University of Technology Sydney and Northern Sydney Local Health District Human Research Ethics Committees (HREC LNR/14/HAWKE/199). This study adhered to the Tenets of the Declaration of Helsinki.

Validation:

Two metropolitan Sydney public hospitals were identified as having stroke units with no current access to on-site eye care professionals. To reach adequate sampling (n=100) within the proposed time frame for data collection (12 months), all stroke survivors admitted to these units for three days or more were eligible for recruitment. Stroke survivors unable to provide verbal responses or to indicate responses, such as matching or

tracing of letters when performing the vision assessment, were excluded from the study. Written consent was obtained before testing commenced, with the support of a family member or guardian if the patient was unable to physically complete the consent process.

For the validation process patients were recruited and then randomly allocated to two groups of equal numbers of participants. In both groups, SVDST was administered once by a NECHP, who were predominantly stroke clinical nurse consultants, occupational therapists, and/or physiotherapists. In Group 1, SVDST was additionally administered by the research orthoptist. In Group 2, in addition to SVDST, a comprehensive orthoptic assessment to provide a standardised assessment was performed by the same orthoptist (figure 1). The order and timing in which any of the assessments were conducted was interchangeable and somewhat dependent on patient and assessor availability, the aim of all assessments was for them be conducted with a minimum interval of 1 to 2 days to reduce the impact of memory triggers and to ensure those recruited into the study would still be admitted and available to complete the second assessment.

Assessment using SVDST:

SVDST has three sections; the first asks stroke survivors and/or any family members present, questions regarding current and past eye health, new visual symptoms and signs and use of glasses. Section 2 recorded observations by the assessor, including identifying any noticeable facial or ocular abnormalities. Section 3 determined stroke survivor responses to a few simple eye movement tests and measures distance and near VA, using a modified chart of a single line of letters and numbers, specifically calibrated to be equivalent to VA 6/12 (Snellen) when used at distances of 2 metres and 1/3 metres, respectively. This level of vision was deemed a suitable benchmark as it is the acceptable legal standard for driving in Australia (Drive, 2012) and the cut-off for a classification of ‘mild visual

impairment' as determined by WHO guidelines (World Health Organisation, 2020). All responses were recorded using tick boxes. In addition, for each section there are instruction guides for further action or referral when responses indicated the presence an ocular condition. Formal assessment of visual fields was not included as it was acknowledged that visual fields are typically tested either during the admissions process by trained medical practitioners, or during the initial therapy assessment by the multi-disciplinary team on the stroke unit (Pollock et al., 2011). Thus, inclusion of visual fields would be duplication of assessment and therefore unwarranted.

Orthoptic Visual Assessment:

The standardised orthoptic visual assessment conducted on patients in Group 2, consisted of firstly, a comprehensive ocular history establishing the presence and management of any existing eye conditions, including glasses if worn. To assess sensory and motor eye function the following tests were performed; near and distance best corrected VA using a 3m LogMAR EDTRS chart, with pinhole if VA was <6/9. When assessing near vision, if the prescribed reading glasses were not present, a substitute pair of +2.00 DS reading glasses were provided. While this was not necessarily the optimal correction for near vision, it did allow an estimation of potential for near VA in those without access to their glasses. This testing is highly relevant for successful participation in vision-based tasks included in rehabilitation.

For the detection of eye movement disorders, tests to disclose ocular motility defects in all positions of gaze and convergence near point were performed. Facial asymmetry and eye lid abnormalities were assessed. Pupil responses to light were assessed to detect visual pathway or brainstem pathology (Leavitt, 2006).

Uniocular confrontational kinetic perimetry was performed to elicit the presence of any gross visual field abnormalities, particularly as one of the most common persistent stroke-related visual defects is hemianopia (Luu et al., 2010). Visual neglect was also assessed by simultaneously holding in front of the patient two separate objects to their right and left and ascertaining simultaneous recognition (Marsh & Kersel, 1993). If information from case history or test results were indicative of ocular pathology, the orthoptist recommended follow-up by an ophthalmologist.

Comparison of outcomes:

For validation, two forms of analysis were performed. Levels of agreement across all sections of SVDST were compared in Group 1 when administered by both NECHP and orthoptist. Matched responses were tallied, with levels of agreement above 80% designated as high in this study.

In Group 2, the screening assessment and comprehensive orthoptic assessment were not identical and therefore could not be similarly analyzed. However, both were attempting to ascertain the presence or absence of visual impairment or ocular abnormality, and while formal assessment of visual fields was not included in SVDST, section 2 does ask the NECHP to observe signs that could indicate visual field loss. As such, measures of sensitivity and specificity for key outcomes were calculated. The key outcomes were defined as follows:

1. Did the vision screening tool detect a pre-existing ocular problem?
2. Did the vision screening tool identify any newly acquired ocular problems?

Findings

The total number of stroke survivors recruited for the study was 126. Twenty-seven were excluded from the study as they were either discharged from hospital before the second eye assessment could be performed, or data obtained was incomplete and therefore unable to

be included in analysis. NECHP reported that on average SVDST took an average of 10 minutes to complete, though somewhat dependent on the patient's state of health. The research orthoptists were able to complete SVDST more rapidly, within an average of seven minutes.

Analysis Group 1:

A total of 49 stroke survivors were recruited into Group 1. The average age was 76 years (range 53-90, standard deviation [SD] 11.93) with a nearly equal male (51%) to female (49%) ratio. Overall, the results obtained when SVDST was administered by NECHP and compared to the orthoptist's recordings shared relatively high levels of agreement across all sections (table 1). However, there were individual responses (table 2) found within sections 1 and 2 of the screening tool that had lower levels of agreement, than the average. When these were removed, the overall level of agreement rose to 91%. Following consultation with the study advisory group, it was discussed that contributing factors to lower levels of agreement for the first three of four questions (as described in table 2) was ambiguity in the questions and the order of delivery of the questions. Clinician expertise and influence on delivery of questions was reviewed, it was found that the second administration of these three questions elicited a positive response, regardless of which clinician (NECHP or orthoptist) administered the vision screening tool first. The remaining question (designed to report ptosis) with only a moderate level of agreement (71.4%) may be attributed to either the inability to differentiate senile lid lag or to the transient nature of the defect and the time difference between the two assessments, with likely recovery before the second assessment. Time between the two administrations of the vision-screening tool did vary but, in most instances (83.7%), it was under 4 days.

Analysis Group 2:

Fifty patients were allocated to Group 2, with the group having an average age of 74 years (range 35-94, SD 13.75) , and 46% were female. Applying the two key outcomes related to detection of pre-existing and newly acquired ocular conditions, comparison of results from SVDST administered by a NECHP was made against the outcome of the comprehensive orthoptic assessment. For pre-existing conditions, SVDST demonstrated 88.5% sensitivity (95% CI 73.26-96.8) and 93.3% specificity (95% CI 68 to 99.8). It was just as successful in achieving the second key outcome; the identification of new conditions (sensitivity; 91.1%, 95% CI 86.4-94.5; specificity; 92.57%, 95% CI 88.8-95.4).

Discussion

The development of SVDST was derived from concern that stroke survivors were not receiving appropriate and timely ocular intervention (Rowe et al., 2009; Wolter & Preda, 2015). This study demonstrates that SVDST is a suitable and valid instrument to be used as a standardised visual-screening assessment tool, to aid the identification of pre-existing and acquired ocular and visual conditions in patients admitted to hospital with stroke.

To further improve reliability and sensitivity for the detection and differentiation between acquired and pre-existing ocular conditions, especially new ocular changes related to the patient's hospital admission and diagnosis of stroke when using SVDST, minor changes were made to the questionnaire component of the tool. This included the addition of prompts and removal of potential ambiguity in the items designed to identify existing ocular conditions. While an amended version has not yet been fully evaluated, post validation feedback received from a predominantly nursing background NECHP focus group

indicated support for the modifications to questions, removing ambiguity and possible misinterpretation, and overall improving the delivery of SVDST.

A potential limitation of this study was the varying intervals between the administrations of the two assessments. This could have influenced the levels of agreement observed, with those delivered at a longer interval experiencing a lower level of agreement due to intervening stroke recovery. For the two questions regarding changes in vision since the stroke (Table 2, item 2) and observation of eyelids (Table 2, item 4), the level of agreement improved to >80.0% when the interval was only one day. A consistent decline in the level of agreement was only seen in patient responses to the one question regarding having an eye problem before stroke (Table 2, item 1) when the interval between the two administrations exceeded six days. Ideally, the interval should be kept to a minimum of one to two days in any future studies.

Failure to detect all ocular conditions that may be present in stroke survivors, particularly visual deficits, has the potential to affect prescribed post-stroke rehabilitation and hence hinder recovery. Thus, implementation of SVDST in stroke wards for use by nurses and other NECHP has the potential to significantly improve patient care.

Other than the routine assessment of cranial nerve function and visual field defects by medical practitioners trained in neurological assessment, there are very few vision-screening tools and standard protocols available for use in the assessment of vision deficits and ocular conditions in stroke survivors (Finsterer, 2003). It has been reported that up to 73% of stroke survivors have some form of visual impairment (Rowe, 2017; Rowe et al., 2019). While visual field defects appear to be readily detected, other more subtle or less well-known ocular and visual deficits may, in the absence of a standardized vision-screening tool to aid in their detection, fail to be captured in stroke survivors. In the UK, since this

validation study commenced, a tool called Vision Impairment Screening Assessment (VISA) has been developed and has been shown to be highly successful in identifying the presence of visual difficulties in stroke survivors that require onward referral (sensitivity; 82 to 97%, specificity; 80-92%) (Rowe et al., 2020). It has a stand-alone screening protocol; however, the assessment document is lengthy, taking 20-40 minutes to complete. At the same time as VISA, a similar tool, the Stroke Vision App (Quinn et al., 2018) was developed for use on hand-held electronic devices, but it does not assess eye movements. The Stroke Vision App was well received by both patients and assessors in its ease of completion. For the assessment of stroke-related visual field defects (sensitivity 79% and specificity 82%) it also performs well, but an overall assessment of visual deficits in stroke survivors (ocular motility or other common and age-related ocular conditions) was limited.

In comparison to these other tools SVDST was designed to take less time to administer, with only a single page document to navigate average completion time was 10 minutes. It does not require an electronic platform which makes it cost effective, and it tests a greater range of ocular conditions and visual functions. To guarantee usability by NECHP including nursing staff located on stroke units, particularly those in regional and rural areas of Australia where there are fewer ophthalmic or orthoptic resources, the study advisory team designed SVDST to be no larger than one A4 page with the vision test printed on the reverse. While the decision to not include visual field or visual neglect assessment could be questioned, these two visual defects are routinely assessed by practitioners in stroke multidisciplinary teams (Jones & Shinton, 2006) and the tool sought not to duplicate existing common practice in the assessment of stroke survivors, rather it sought to agument current protocols.

While the most effective way to safeguard accuracy of patient assessment is to have a trained eye care practitioner, such as an orthoptist, made available to all stroke units across health districts in Australia, this is not yet feasible because of manpower issues (Jolly et al., 2019). In such circumstances, the use of a standardised vision-screening tool, designed for use by nurses and other NECHP, is an immediate solution. Further education of nurses and other NECHP in the recognition of common age-related eye conditions may also enhance accuracy. In addition, SVDST provides an avenue for identification and documentation of pre-existing conditions, such as the need for glasses to be worn, glaucoma medication to be administered and for ongoing management of other pre-existing age-related eye diseases. These conditions may also require modification of intended rehabilitation plans, strategies, and tasks.

Impact statement

Early identification of pre-existing and acquired vision problems via a standardised screening protocol in stroke survivors supports patient care, enhancing rehabilitation outcomes.

Conclusion:

We report the validation of a new standardised vision-screening tool (SVDST) designed specifically for use by NECHP which includes nurses for stroke survivors. While validated for an Australian setting, it is likely that this tool could be adapted for use in other locations. It has the advantage of having high sensitivity for the detection of ocular and visual conditions in stroke survivors, as well as being easy to administer in a relatively short space of time. These characteristics may favorably affect NECHP workload and therefore uptake of the tool in the care of stroke survivors. Further studies considering the impact of SVDST on informing rehabilitation plans, the consequent time and level of recovery, need to be undertaken. These may demonstrate further benefit of the tool to the management of stroke survivors

and their satisfaction with the care provided, as well as their ultimate outcomes.

Word count 3124 (main text excluding references)

References:

Bonita, R., Anderson, C. S., Broad, J. B., Jamrozik, K. D., Stewart-Wynne, E. G., & Anderson, N. E. (1994). Stroke incidence and case fatality in Australasia. A comparison of the Auckland and Perth population-based stroke registers. *Stroke, 25*(3), 552-557.

Dewey, H. M., Thrift, A. G., Mihalopoulos, C., Carter, R., Macdonell, R. A., McNeil, J. J., & Donnan, G. A. J. S. (2001). Cost of stroke in Australia from a societal perspective: results from the North East Melbourne Stroke Incidence Study (NEMESIS). *32*(10), 2409-2416. https://www.ahajournals.org/doi/pdf/10.1161/hs1001.097222?download=true

Drive, A. F. T. (2012). Assessing Fitness to Drive.

Feigin, V. L., Forouzanfar, M. H., Krishnamurthi, R., Mensah, G. A., Connor, M., Bennett, D. A., Moran, A. E., Sacco, R. L., Anderson, L., & Truelsen, T. (2014). Global and regional burden of stroke during 1990–2010: findings from the Global Burden of Disease Study 2010. *The Lancet, 383*(9913), 245-255. https://ac.els-cdn.com/S0140673613619534/1-s2.0-S0140673613619534-main.pdf?_tid=c4fa3b2d-2099-45eb-b0ee-38f70a0825b4&acdnat=1548260835_1a046bf0fc514d01d0afe05243d8d197

Feigin, V. L., Lawes, C. M., Bennett, D. A., & Anderson, C. S. (2003). Stroke epidemiology: a review of population-based studies of incidence, prevalence, and case-fatality in the late 20th century. *The Lancet Neurology, 2*(1), 43-53. http://ac.els-cdn.com/S1474442203002667/1-s2.0-S1474442203002667-main.pdf?_tid=23d40fee-5705-11e3-a4bb-00000aab0f6c&acdnat=1385516714_3b3189e7d2bd54f2319f164355fcb7b6

Finsterer, J. (2003, June 01). Ptosis: Causes, Presentation, and Management [journal article]. *Aesthetic Plastic Surgery, 27*(3), 193-204. https://doi.org/10.1007/s00266-003-0127-5

Hepworth, L., & Rowe, F. J. (2016). Visual impairment following stroke–the impact on quality of life: a systematic review. *Ophthalmology Research: an international journal, 5*(2), 1-15.

Jolly, N., Kelly, J., Silveira, S., & Giribaldi, M. (2019). Orthoptics Australia workforce survey 2017. *Australian Orthoptic Journal, 51*, 25-30.

Jones, S. A., & Shinton, R. A. (2006). Improving outcome in stroke patients with visual problems. *Age and ageing, 35*(6), 560-565. http://ageing.oxfordjournals.org/content/35/6/560.full.pdf

Leavitt, J. A. (2006, February 01). Diagnosis and management of functional visual deficits [journal article]. *Current Treatment Options in Neurology, 8*(1), 45-51. https://doi.org/10.1007/s11940-996-0023-9

Lotery, A. J., Wiggam, M. I., Jackson, A. J., Refson, K., Fullerton, K., Gilmore, D., & Beringer, T. (2000). Correctable visual impairment in stroke rehabilitation patients. *Age and ageing, 29*(3), 221-222.

Luu, S., Lee, A. W., Daly, A., & Chen, C. S. (2010). Visual field defects after stroke.

Marsh, N. V., & Kersel, D. A. (1993, 1993/07/01). Screening tests for visual neglect following stroke. *Neuropsychological Rehabilitation, 3*(3), 245-257. https://doi.org/10.1080/09602019308401439

Neryla Jolly, K. T., Ann Macfarlane. (2008). The Orthoptist and the management of visual problems in inpatients with stroke: A pilot study to compare existing models of care [report].

Pollock, A., Hazelton, C., & Brady, M. (2011, 2011/10/01). Visual Problems After Stroke: A Survey of Current Practice by Occupational Therapists Working in UK Stroke Inpatient Settings. *Topics in Stroke Rehabilitation, 18*(sup1), 643-651. https://doi.org/10.1310/tsr18s01-643

Quinn, T. J., Livingstone, I., Weir, A., Shaw, R., Breckenridge, A., McAlpine, C., & Tarbert, C. M. (2018, 2018-March-28). Accuracy and Feasibility of an Android-Based Digital Assessment Tool for Post Stroke Visual Disorders—The StrokeVision App [Clinical Trial]. *Frontiers in Neurology, 9*(146). https://doi.org/10.3389/fneur.2018.00146

Robison, J., Wiles, R., Ellis-Hill, C., McPherson, K., Hyndman, D., & Ashburn, A. (2009). Resuming previously valued activities post-stroke: who or what helps? *Disability & Rehabilitation, 31*(19), 1555-1566.

Rodgers, H., Bond, S., & Curless, R. (2001). Inadequacies in the provision of information to stroke patients and their families. *Age and ageing, 30*(2), 129-133. https://doi.org/10.1093/ageing/30.2.129

Rowe, F., Brand, D., Jackson, C. A., Price, A., Walker, L., Harrison, S., Eccleston, C., Scott, C., Akerman, N., & Dodridge, C. (2009). Visual impairment following stroke: do stroke patients require vision assessment? *Age and ageing, 38*(2), 188-193. http://ageing.oxfordjournals.org/content/38/2/188.full.pdf

Rowe, F. J. (2017). Vision In Stroke cohort: Profile overview of visual impairment. *Brain and Behavior, 7*(11), e00771. https://doi.org/doi:10.1002/brb3.771

Rowe, F. J., Hepworth, L., Howard, C., Bruce, A., Smerdon, V., Payne, T., Jimmieson, P., & Burnside, G. (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. https://doi.org/10.1136/bmjopen-2019-033639

Rowe, F. J., Hepworth, L. R., Howard, C., Hanna, K. L., Cheyne, C. P., & Currie, J. J. P. o. (2019). High incidence and prevalence of visual problems after acute stroke: An epidemiology study with implications for service delivery. *14*(3), e0213035. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6402759/pdf/pone.0213035.pdf

Shankar Shrestha, G., Upadhyaya, S., Kumar Sharma, A., & Prasad Gajurel, B. (2012). Ocular visual defect and visual neglect in stroke patients: A report from Kathmandu, Nepal. *Journal of Optometry: peer-reviewed Journal of the Spanish General Council of Optometry, 5*(1), 43-49.

Thrift, A. G., Dewey, H. M., Macdonell, R. A. L., McNeil, J. J., & Donnan, G. A. (2000). Stroke incidence on the East Coast of Australia The North East Melbourne Stroke Incidence Study (NEMESIS). *Stroke, 31*(9), 2087-2092. http://stroke.ahajournals.org/content/31/9/2087.full.pdf

Tsai, S. Y., Cheng, C. Y., Hsu, W. M., Su, T. P., Liu, J. H., & Chou, P. (2003, Feb). Association between visual impairment and depression in the elderly [Research Support, Non-U.S. Gov't]. *J Formos Med Assoc, 102*(2), 86-90. http://www.ncbi.nlm.nih.gov/pubmed/12709736

Williams, R. A., Brody, B. L., Thomas, R. G., Kaplan, R. M., & Brown, S. I. (1998). The psychosocial impact of macular degeneration. *Archives of ophthalmology, 116*(4), 514-520. https://doi.org/10.1001/archopht.116.4.514

Wolter, M., & Preda, S. Visual deficits following stroke: maximizing participation in rehabilitation [Review]. *Topics in Stroke Rehabilitation, 13*(3), 12-21. http://ezproxy.library.usyd.edu.au/login?url=http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med4&AN=16987788 http://DD8GH5YX7K.search.serialssolutions.com/?sid=OVID:medline&id=pmid:16987788&id=doi:&issn=1074-9357&isbn=&volume=13&issue=3&spage=12&pages=12-21&date=2006&title=Topics+in+Stroke+Rehabilitation&atitle=Visual+deficits+following+stroke%3A+maximizing+participation+in+rehabilitation.&aulast=Wolter

World Health Organisation. (2020, 2020). *Blindness and vision impairment*. https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment

Wu, S.-Y., Hennis, A., Nemesure, B., & Leske, M. C. (2008). Impact of Glaucoma, Lens Opacities, and Cataract Surgery on Visual Functioning and Related Quality of Life: The Barbados Eye Studies. *Investigative ophthalmology & visual science, 49*(4), 1333-1338. https://doi.org/10.1167/iovs.07-1252

Table 1: Average levels of agreement Group 1

Vision screening tool sections:	Average total levels of agreement
1. Questioning past and current ocular health changes	85%
2. Observations: current facial and ocular posture	92%
3. Visual acuity measure	86.5%

Table 2: Responses, lowest levels of agreement Group 1

1. Patient said: Had an eye problem before the stroke?	66%
2. Patient said: Have had any changes in their vision since they had the stroke?	78%
3. Patients said: Have uncomfortable eyes i.e. sore, itchy, dry, watery, red, crusty?	74%
4. Observed: Droopy upper or lower eyelid	72%

Figures:

Figure 1: Flow chart, group allocation and analysis

Figure 2: Vision Defect in Stroke screening tool, reproduced with permission from Agency of Clinical Innovation (ACI).

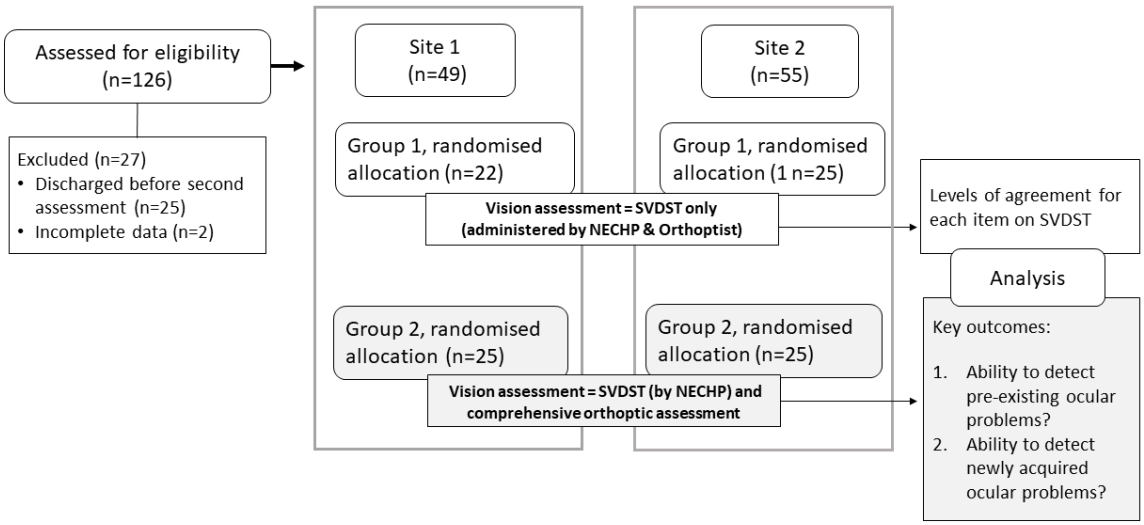

Figure 1, Flow chart, allocation and group analysis

Figure 2:

NSW Health

Facility:

FAMILY NAME | MRN

GIVEN NAME | ☐ MALE ☐ FEMALE

D.O.B. _____/_____/_____ | M.O.

ADDRESS

LOCATION / WARD

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

VISION DEFECT IN STROKE SCREENING TOOL

Identification of Vision Problems in patients with Stroke

Please complete pages 1 & 2 by direct communication with the patient/ their carer and/or observation of the patient & document findings in the Action column

Completed by: _____ Date: _____

QUESTION	Yes	No	ACTION
ASK if the patient:			
Have ever had their eyes tested?	☐	☐	**Yes** — **Date of last eye test:_____ with: _____**
Had an eye problem before the stroke? (*Such as: glaucoma, cataracts, macular degeneration or eye changes due to diabetes*)	☐	☐	**Yes** — **list known eye conditions:**
Routinely uses eye drops?	☐	☐	**Yes** — **List eye drops & use. Record in medical record:**
Wears glasses (*or contact lenses)*?	☐	☐	**Yes** — **Use appropriate glasses**
If so what for? *(tick one or both)* o Near e.g. reading ☐ o Distance eg. driving/TV ☐			
Are glasses with the patient?	☐	☐	**No** — **Ask carer to bring glasses in**
Had any change in their vision since being admitted to hospital with this stroke?	☐	☐	**Yes** — **Refer for detailed eye examination**
Does your vision problem improve by wearing glasses?	☐	☐	**Yes** — **Use appropriate glasses for activities** **No** — **Refer for detailed eye examination**
Do you have double vision?	☐	☐	**Yes** — **Refer for detailed eye examination**
Do you ever have sore, itchy, dry, watery, red or crusty eyes?	☐	☐	**Yes** — **Use appropriate eye drops. If this fails refer for eye examination**
OBSERVE for Droopy upper or lower eyelid	☐	☐	Refer for detailed eye examination if the answer is **Yes** for any observation **Note observation**
Shutting of an eye(s)	☐	☐	
Nystagmus (wobbling eyes)	☐	☐	
Patient misses seeing things or bumping into things	☐	☐	
CAN the patient without moving their head: Look at an object with both eyes at the same time	☐	☐	Refer for detailed eye examination if the answer is ***No*** for any action
Look from one object to another	☐	☐	
Follow an object smoothly from one side to the other	☐	☐	
Follow an object smoothly up and down	☐	☐	
CAN the patient see: Near Print – test over the page	☐	☐	Refer for detailed eye examination if the answer is ***No*** for either test
Distance Print – test over the page	☐	☐	
ACTIONS			☐ **No Action** ☐ **Eye Drops** ☐ **Glasses** ☐ **Onward Referral**

Name: _____ Designation: _____

Signature: _____ Date: _____/_____/_____

VISION DEFECT IN STROKE SCREENING TOOL

SMR060.200

NO WRITING

NSW Health

Facility:

VISION DEFECT IN STROKE SCREENING TOOL

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. _____/_____/_____	M.O.
ADDRESS	
LOCATION / WARD	
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	

NEAR PRINT TEST

- **TEST IN GLASSES IF USUALLY WORN BY THE PATIENT**
- HOLD THE PAGE AT ELBOW LENGTH FROM THE PATIENT
- ASK THE PATIENT TO READ THE LETTERS BELOW AT ELBOW LENGTH FROM THE EYES

N E R X 1 4 3 5

DISTANCE PRINT TEST

- **TEST IN GLASSES IF USUALLY WORN BY THE PATIENT**
- HOLD THE PAGE AT 2 METRES FROM THE PATIENT
- ASK THE PATIENT TO READ THE LETTERS BELOW AT 2 METRES FROM THE PATIENT (if patient sitting in bed 2m is at end of bed)

A T O V 5 7 4 3

NO WRITING