Parametric Visual Evaluation (PAVE study); development of a vision screening tool for ambulance staff (V-FAST)

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Word count: 3814

Number of tables: 4

Number of figures: 5

Cover title: Paramedic visual evaluation study: V-FAST

Disclosures:

All authors declare: no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work. This article/paper/report presents independent research funded by the North West Ambulance Service. The views expressed are those of the authors and not necessarily those of the NHS, the NWAS or of the University of Liverpool.

Criteria for authorship:

FR and JD designed this study, FR, JD, FA, LH and RB drafted this paper, all authors contributed to final approval of the paper and all agree to be accountable for the accuracy and integrity of the results.

Abstract

Aim: We aimed to develop and evaluate the V-FAST screening tool and training package to improve diagnostic accuracy of identifying visual impairment in hyper-acute strokes.

Methods: The educational package was developed through focus groups. The pilot study screened suspected strokes pre-hospital; the V-FAST tool (visual symptoms, eye movements, visual field, visual extinction) was used with 43 suspected strokes. Each participant was assessed in hospital using the NIH stroke scale with results compared to V-FAST screening to determine sensitivity and specificity.

Findings: The education package includes detailed instructions with video. In the pilot study, V-FAST detected visual impairment in 75.9% of FAST positive and 80% of FAST negative strokes. Sensitivity and specificity compared to NIHSS were 85.7% and 42.1% respectively.

Conclusion: V-FAST has good sensitivity to detect vision impairment when screening possible strokes. The added education package facilitates greater knowledge and understanding of potential visual problems due to stroke.

Keywords: Stroke, Visual impairment, Ambulance service, screening, 999

Key points

- There is currently no standardised screening for visual impairment by ambulance services.
- V-FAST is a vision screening tool using simple validated assessments of visual function.
- V-FAST is delivered as a 2-minute vision screening assessment for use specifically in stroke suspect patients.
- V-FAST is supported by an education package with detailed instructions and a video guide.

Introduction

Visual impairment following stroke is common and estimated to affect two thirds of all stroke survivors [1]. There is currently no standardised screening for visual impairment by ambulance services. A particular issue is posterior circulation stroke in which visual impairment is common such as visual field loss, visual inattention and eye movement disorders and are commonly FAST negative [2]. There is no ambulance service screening provided for these combined visual problems; thus there is the potential for misdiagnosis or missed diagnosis.

Where strokes affect the occipital lobe only, around 90% of patients will have only visual complaints [3]. It is therefore important to assess specifically for this. Furthermore one quarter of stroke survivors are of working age [4], and often easily misdiagnosed where their primary complaint is visual, typically as migraine.

The consequences of mis- or missed diagnosis are that patients are not directed to the appropriate level of stroke care or receive treatment within the thrombolysis time window and therefore thrombolysis becomes a treatment option which is not available to this group of patients [5]. As a result visual impairment can be permanent with life changing disability and impact to daily life including loss of confidence, impaired mobility, inability to judge distances and increased risk of falls [6]. There is a known link between poor vision, quality of life and depression in older persons [7].

For these reasons it is important that patients with visual impairment are identified by the ambulance service to improve diagnostic accuracy and ensure appropriate onward referral. There are wide-ranging visual impairments relating to stroke [1,2]. Thus, in this study we aimed to develop a quick vision screening tool using simple validated assessments of visual

function that identify the most common visual impairments associated with stroke, and coupled with a supporting education package.

Methods

Ethical approval

This prospective study had institutional ethical approval (Ref-1782) and was undertaken in accordance with the Tenets of Helsinki.

Education package

We report our development process in accordance with COREQ guidelines [8] which are the accepted standard for evaluation of the methodological quality of qualitative research.

Steering committee

In the development of this study we established a steering committee to oversee the conduct of the study. The committee comprised two research and clinically active orthoptists, one neuro-ophthalmologist, one paramedic and one stroke survivor.

Focus group meetings

Two facilitated focus group meetings were held with experts in stroke vision research, paramedic practice and stroke survivors – identified from their responses from study advertisements through national professional research networks and specialist interest groups. Information was collected through a semi-structured group interview process. In recognition that some individuals are more vocal than others, a nominal group technique

was used. This is a structured method for group brainstorming that encourages equal contributions from everyone. We aimed for 6-12 participants per focus group meeting.

In the first focus group meeting we used a nominal group technique consisting of five stages:

1. Introduction and explanation of the study was provided by the facilitator.
2. Each participant was asked to consider each of seven questions identified by the steering committee from a prior study comparing ambulance service detection of visual problems versus Emergency Department assessments with the National Institute for Health Stroke Scale (NIHSS) versus specialist vision assessments [9].
3. Each participant in turn was asked to share their ideas. The facilitator recorded each idea as the participants outlined their ideas.
4. Group discussion between participants took place as the next step. Each idea was discussed with explanations provided where required for any idea lacking clarity.
5. Content decisions formed the concluding stage of the focus groups. Participants agreed the content of an education package based around a vision screening tool that included assessment of visual symptoms, eye movements, visual field loss and visual attention – relating to posterior circulation stroke.

Once the content was agreed for the education package, a smaller writing group was formed from the focus group participants and members of the steering committee to develop the content into an education package - but keeping the full focus group participants involved in proofing the emerging guide through email contact. The education package emerged through an iterative process.

A second focus group was held to discuss the final draft of the education package and screening tool (V-FAST tool) using the same nominal group technique to ensure facilitated equal contribution to discussion and decision making for the final versions. The final versions of the education package and screening tool were then checked and approved by the senior education team at the North West Ambulance Service (NWAS) and placed on the NWAS online education platform.

Pilot screening tool evaluation

We report our evaluation process in accordance with STARD guidelines [10] which are the accepted standard for evaluation of the methodological quality of cross section cohort studies.

Design

A prospective cross section comparative study was undertaken in two geographically separate ambulance services within the NWAS. Members of this ambulance service had completed the online education package for the V-FAST screening tool. The target population was patients, recruited as a convenience sample, in the hyper-acute phase at pre-admission to hospital with a suspected clinical diagnosis of stroke.

Screening protocol

All patients being attended to by the ambulance service following a call-out with suspected stroke were vision screened by the ambulance service using the V-FAST vision screening tool.

Reference standard assessment

Each patient was assessed as per routine NHS clinical care by an admitting stroke clinician in the Emergency Department using the NIHSS. Specific aspects extracted from the clinical notes for this study included:

- Visual symptoms,
- NIHSS 2: Eye movements – horizontal gaze,
- NIHSS 3: Visual fields - hemianopia,
- NIHSS 11: Visual attention – extinction
- Report of a detected visual impairment by other methods

Outcome measures

The primary outcome measure was presence or absence of visual impairment (defined as visual field loss, eye movement abnormality, visual attention abnormality) and recorded as a binary measure: Present/Absent. Results were taken in numerical format from the referral forms completed by both the ambulance service and NIHSS. These were inputted to a trial database.

Statistical methodology and sample size

For pilot assessment of the screening tool, we aimed to recruit a minimum of 30 patients. Results were recorded in binary form (Present/Absent) for visual impairment and across types of visual impairment. We estimated the level of specificity (proportion of patients without visual impairment that are correctly identified), sensitivity (proportion of patients with visual impairment that are correctly identified), positive predictive value (probability

that visual impairment is present when indicated by V-FAST), negative predictive value (probability that visual impairment is absent when indicated by V-FAST) and accuracy (overall probability that the patient is correctly classified with or without visual impairment). Corresponding 95% confidence intervals were provided for all calculations.

Results

Education package

The first focus group consisted of eight participants; the facilitator (FR), one research orthoptist, four paramedics and two stroke survivors. A further three participants did not attend because of work or family commitments. The second focus group consisted of seven participants; the facilitator (FR), one research orthoptist, one clinical orthoptist, three paramedics and one stroke survivor. A further two participants did not attend because of work commitments or illness. Each focus group was conducted over a 3-hour period and both were held in Liverpool. Notes were taken by the facilitator during the focus group discussions and question responses were further documents on flip charts as well as in note-taking.

Each question and summaries of discussion are outlined in Table 1.

Screening tool – V-FAST and education package

The screening tool was created as a simple checklist (Figure 1) alongside a reporting form (Supplementary file 1). Five sections within the tool included;

1. Visual symptoms and observations,
2. Reading,

3. Eye position and movement,
4. Visual fields,
5. Visual extinction.

For the education package, core elements are outlined in Table 2 (full details in Supplementary file 2). The ambulance service were provided with detailed instructions regarding correct use of the assessments required for screening. The tool was designed for self-training, i.e. it contained detailed instructions on how to use the screening tool, the way in which each screening test should be correctly undertaken, cut-offs for what results meet normal or abnormal criteria plus guidance and tips.

The screening assessment was timed to take approximately 2 minutes to administer and a training video was provided as part of the education package to illustrate step-by-step instructions on completion of the V-FAST assessment.

The free-to-access V-FAST tool is available on; www.vision-research.co.uk *(this link will go live on publication of this paper)*.

Pilot screening tool evaluation

The pilot study recruited 43 patients requiring assessment during 999 call-out for suspected stroke (Figure 1) inclusive of 42% females and 58% males. All patients were admitted to either of two regional hospitals, both with adjoining hyper-acute and acute stroke units. Thus there was no distinction between referral for FAST positive or negative patients for these hospitals. Overall visual problems were noted on V-FAST assessment in 26 patients

(60.5%). In 21 patients (48.8%) only a partial visual assessment could be made based on the patient's ability at the time.

The stroke assessment was FAST positive in 29 patients (67.4%) and FAST negative in five patients (11.6%). This was not recorded in the remainder of patients. Visual problems were present in 22 of 29 (75.9%) FAST positive patients and in four of five (80%) FAST negative patients (Table 3a).

Section 1 visual symptoms and observations

Thirteen patients (30.2%) reported new visual problems and eight (18.6%) reported that vision was different. No visual symptoms were reported in the remainder. Five had specific new visual symptoms recorded including blurred vision; sudden drop of the right eyelid; old blindness but with dense visual neglect; right eye turning out; and hazy vision.

Abnormal lid position (i.e. ptosis or asymmetry of lids right vs left) was noted for eight patients (18.6%), unequal (right vs left) pupil reactions in four (9.3%), squint/eye turn in four (9.3%), patient closing one eye in five cases (11.6%) which could be an indication of diplopia and patient moving head to see in seven cases (16.3%) which could be an indicator for visual field loss.

Section 2 reading

Impaired reading was noted in nine patients (20.9%) with the assessment undertaken with reading glasses if required. There was no determination made as to whether the reading difficulty was eye or cognition related.

Section 3 eye position and movement

Abnormal eye position was noted in five patients (11.6%); two patients with a downward positioned eye and one patient each for an inward, outward and elevated positioned eye.

Abnormal eye movements were noted for twelve patients including impaired upgaze in one patient, impaired downgaze in two patients, impaired right gaze for one, impaired left gaze for three and nystagmus in five cases.

Section 4 visual fields

Abnormal visual fields to confrontation were recorded in eight patients (18.6%). Specific defects noted for these patients included a defect in the right central area, bilateral inferior quadrant defects, general restriction of the visual fields, partial left-sided homonymous hemianopia and two cases of partial right-sided homonymous hemianopia.

Section 5 visual extinction

Abnormal extinction responses was noted in three patients (7%) to the right side and three patients to the left side (7%).

Emergency Department assessment

Stroke diagnosis was confirmed for 25 patients, medical or other causes for 13 patients and transient ischaemic attack for five patients (Table 3b).

An admission assessment was available for 33 patients; the NIHSS was recorded for 26 patients. Visual problems were confirmed for 12 patients (36.4%) during stroke evaluation and confirmed for 7 patients (26.9%) by NIHSS. The total score on NIHSS was a mean of 7.46 (SD 6.69, range 0-28). Four patients (15.4%) had horizontal gaze issues noted on NIHSS, four patients had visual field loss (15.4%), and five patients (19.2%) had extinction/inattention issues noted on the NIHSS.

V-FAST assessments by the ambulance service in comparison to Emergency Department visual assessments are outlined in table 3c. Sensitivity was calculated at 85.7% (95%CI; 42.1-99.6%) and specificity of 42.1% (95%CI; 20.3-66.5%). Positive predictive value was 35.3% (95%CI; 25.1-47.1%) and negative predictive value of 88.9% (95%CI; 54.7-98.2%) with overall accuracy of 53.9% (95%CI; 33.4-73.4%).

Discussion

We report the development of the V-FAST vision screening tool for use by the ambulance service in 999 call-outs for suspected stroke. This is coupled with an education package inclusive of a video to support the use of the V-FAST tool. V-FAST was developed, as an adjunct to routinely used stroke assessment, but specifically to improve the detection of vision problems and support added evaluation of potential FAST negative strokes which are typical of posterior circulation infarction.

V-FAST is not the first adaption of the FAST assessment to include vision. Table 4 outlines various stroke screening checklists that include a vision component; these checklists are not used standardly in the ambulance service. In 2013, FAST AV and/or FAST AB were developed; AV relating to ataxia and visual disturbance and AB relating to ataxia and blindness. Adding AV or AB to FAST increased sensitivity for early recognition of posterior circulation stroke [11]. BE-FAST was an adaptation of FAST to include sudden loss of balance or coordination (B) and eyesight changes (E). BE-FAST was reported to reduce the number of missed FAST negative strokes by about 10% with particular relevance to posterior circulation stroke [12]. FAST-AVVV was developed in 2016 to add acute sudden onset ataxia (A), sudden acute onset visual field defect (V), vertigo (V) and vomiting (V) [13].

Further adaptations include 'Give Me 5 for Stroke' [14] which was developed by the USA Stroke Collaboration in 2008 in place of FAST and includes walk, talk, reach, see ('Is their vision all or partly lost?') and feel. The ABCD-E2 tool includes ataxia, blindness (unilateral/bilateral), consciousness, dysphagia, eye 1 (diplopia) and eye 2 (pupils) [15; 16]. The Miami Emergency Neurologic Deficit checklist includes twelve assessments inclusive of mental status checks, cranial nerve assessments and limb function assessments [17]. MedPACS (Medical Prehospital Assessment for Code Stroke) includes vision assessment alongside face, arm, leg and speech [18] as does the ROSIER (Recognition of Stroke in the Emergency Department) assessment [19].

Although these screening checklists include assessments of vision, most were limited in the type of visual deficit being screened. V-FAST was developed on the basis of the most common types of visual impairment detected in two large prospective stroke/vision studies [1; 2] with consensus reached from focus group meetings on the key elements to include in a short (approximate 2-minute) screening assessment. Thus, the component parts include documentation of visual symptoms and observations, checks of eye position and eye movements (horizontal, vertical and nystagmus), visual fields and visual extinction. Although balance and coordination is not a specific section in V-FAST, the symptoms section asks about sudden onset dizziness and balance issues which are common questions alongside vision assessments. V-FAST detected visual impairment in 75.9% of FAST positive and 80% of FAST negative stroke diagnoses. Sensitivity and specificity values were 85.7% and 42.1% respectively when comparing V-FAST responses to NIHSS visual impairment detection rates. The low specificity is due to a high number of false positives which could be due to the ability for the V-FAST to detect a wider range of visual impairment than the NIHSS. The NIHSS is limited in its assessment of visual function and does not consider visual acuity or

reading ability or eye alignment and ocular movements. The types of vision problems identified included blurred vision, abnormal lid position, strabismus, eye movement defects, visual field loss and visual neglect. Whilst many of these problems may be caused by conditions other than stroke, they are also common as a consequence to stroke [1,2]. The importance of diagnosing these visual problems is that they may be the only presenting sign/symptom of stroke which could impact on the initial medical assessment and treatment of the potential stroke patient.

FAST is a well-established global tool for early recognition of stroke. It is particularly useful in the detection of anterior circulation strokes. V-FAST is a mnemonic that has been used in awareness messages regarding stroke and vision for many years [20] and adapted into a formal screening tool in this PAVE study. It encapsulates the essence of the FAST message but adds the vision component which is important given the high incidence (circa 60%) of new onset visual problems in acute stroke [1]. It is essential to continuously strive for improvement in detection accuracy to maximise access to treatment pathways in a timely manner such as expedited access to hyper-acute stroke units, thrombolysis and thrombectomy, but also for secondary prevention management. This is of particular relevance to posterior circulation strokes [21]. The potential for misdiagnosis is high with stroke mimics such as migraine which also presents with sudden onset visual disturbance. Hence, the education package developed alongside our V-FAST tool is useful in providing background information about such stroke mimics and in understanding the visual system better. Arguably there may be a knock-on positive benefit to using the assessment in any neurological-related assessment other than stroke in addition to its use in eye-related incidents although this warrants further research.

Limitations

Although we piloted V-FAST in 43 call-out assessments, this small sample size is a limitation. This study used a convenience sample and thus is not representative of a general stroke cohort. Ambulance staff did not use this screen on all stroke suspects and therefore could have been more likely to use the V-FAST when they suspected a visual problem; this is a recruitment bias. We conducted a pragmatic study and, as part of the tool, patients were asked if they had any new problems with their eyes or vision. However, no orthoptic or ophthalmology reviews were collected; therefore, it is not possible to confirm whether the visual impairments reported were new or old. Types of visual problems documents in this small cohort were however typical of those reported in larger studies of stroke-related visual impairment.

Further, the pilot study was limited to a regional geographic area. Further studies for formal validation with a larger sample size and larger geographical area are recommended. Our comparison of V-FAST was to stroke and NIHSS assessments made in the Emergency Department. Further studies could consider comparisons to specialist eye assessments and to compare imaging results for anterior versus posterior strokes in relation to FAST positive or negative strokes with and without visual impairment.

Conclusions

V-FAST is a new rapid 2-minute vision screening assessment for use specifically in stroke suspect patients. It is supported by an education package with detailed instructions and a video guide. Initial pilot results are promising. Further studies are now warranted to determine if sensitivity, specificity and overall accuracy improve in larger scale studies.

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Table 1

Question 1; What is your current knowledge of potential visual problems that may occur due to stroke?
Responses: Very limited knowledge. Little in the way of assessment and lack of understanding of visual problems. Reliant on the patient reporting visual symptoms. Split knowledge of paramedics depending on their training (University, Paramedics, Technicians). No extended history taking skills. No research evidence. Pupillary response checked. Questioning at point of 999 call.
Question 2; How would you currently assess patients during call-out for possible visual problems? What do you consider important if having your vision assessed in an emergency?
Responses: Must show benefit to patients. Need knowledge of related anatomy and physiology for vision. Show the benefits of proposed changes to paramedic assessment. Educate new tool in line with basic FAST training. Impact on patients and families in a centralised model of care. Include patient stories. Information on why change should be made – why does FAST not catch all strokes with link to anatomy and physiology. Provide impact on percentage of population. Increase in paramedic knowledge versus public knowledge. Ensure assessment is more accurate to other available options, e.g. West Midlands AVVV (field assessment but no specific method – for FAST negative patients), South West England use of MEND assessment.
Question 3; What background vision information do you think should be provided in an education manual?
Responses: Include main facts. Percentage of stroke survivors with visual impairment. Percentage of those missed as having visual impairment by paramedic and/or NIH stroke scale on admission. Plus consequences of being missed. Type of visual impairment and why they occur (anatomy and physiology). Patient stories. Evidence – if paramedics detect there is a visual problem, often the doctors do as well. Include information about what else we know occurs; speed of detection leads to more uptake on thrombolysis/thrombectomy. Provide information about TIA and vision, e.g. amaurosis fugax.
Question 4; What level of detail is required for description of visual assessment techniques?
Responses: Full detail of everything required – spoon feed. Ensure information is not open to interpretation. Include one-page prompt guides. Alternatives to assessment when testing in the patient's home versus when the patient is on a stretcher. Include videos/pictures/facebook access. Important to include percentage of missed cases in FAST positive versus negative cases. Potential to link with the Stroke Association regarding basic assessment guide for vision. Potential to provide all training material to GPs at later stage.
Question 5; What type of 'tips' would be useful in training material?
Responses: Use of acronyms. Testing tips already used in orthoptic practice. Picture guides.

Question 6; What are the key features to include in 1-page assessment guides?
Responses: As for question 5 – tips. Use stepwise information and flowcharts. Mix of text boxes and pictures.
Question 7; What format of training could be effective, e.g. formal lecture, interactive, problem-based learning, etc?
Responses: Train the trainer events. Use of pre-reading. Formal lectures using powerpoint teaching each part of the manual in turn. Include practical. Option to start the training by asking paramedics to read the one-page assessment guides and show how they would assess based on their interpretation of the guide. This would highlight issues with interpretation and ambiguity which would allow us to alter and refine the guides further for accuracy. Then provide full teaching and repeat the practical testing at the end. Aim to train consultants, advanced practitioners and senior paramedics with training provided in June.

Table 2 Training manual contents

Background	Visual impairment due to stroke and acquired brain injury
Introduction	Screening instructions and assessment
Section 1	History
Section 2	Eye alignment and movement
Section 3	Reading
Section 4	Visual fields
Section 5	Visual inattention/extinction
Supplementary	Visual/stroke mimics and TIA
	Vision anatomy and physiology

Table 3 Visual impairment detection

A Visual impairment in FAST positive/negative tests (n=43)

		FAST		
		Positive	Negative	Not recorded
Visual impairment	No	7	1	5
	Yes	22	4	4

B Visual impairment from V-FAST versus stroke diagnosis (n=43)

Diagnosis	Visual Impairment from V-FAST		
	Present	Absent	
Stroke	17	8	
Transient ischaemic attack	5	0	
Medical / other	8	5	Lid defect (n=2), field loss (n=2), squint, nystagmus, pupil defect, difference with vision

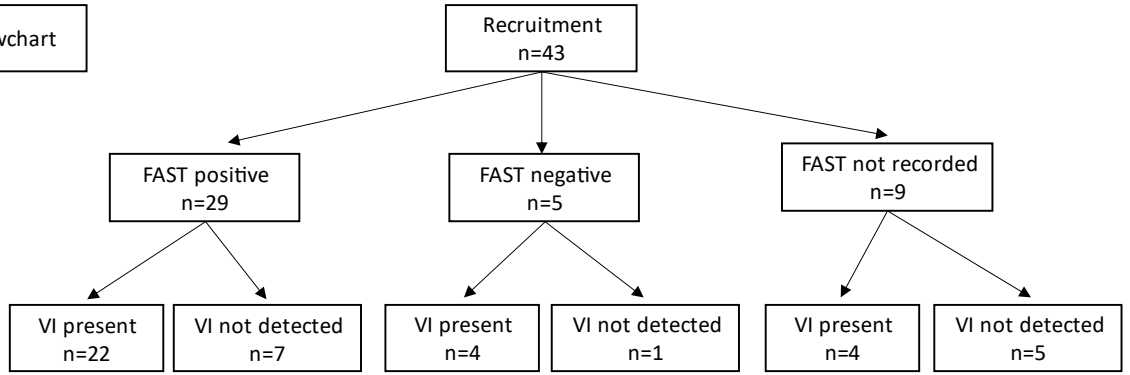
C Visual impairment from V-FAST and NIHSS (n=26)

		Visual Impairment from V-FAST	
		Present	Absent
NIHSS	Present	6	1
	Absent	11	8

Table 4 Stroke/Vision screening checklists

	Face	Arm	Speech	Coordination/ Balance	Limb	Consciousness	Vertigo	Vomiting	Ataxia	Eyes	Vision components
ABCD-E2 [15,16]			x			x			x	x	Blindness, diplopia, pupils
BEFAST [12]	x	x	x	x						x	Blurred vision, double vision, persistent vision trouble
FAST AV [11]	x	x	X						x	x	Visual disturbance
FAST AB [11]	x	x	x						x	x	Blindness
FAST AVVV [13]	x	x	x				x	x	x	x	Visual fields
GiveMe5forStroke [14]		x	x		x					x	Vision all or partly lost
MedPACS [18]											
MEND [17]	x	x	x		x	x				x	Visual fields, horizontal gaze, nystagmus
Rosier [19]	x	x	x		x					x	Visual fields
V-FAST	x	x	x							x	Symptoms, pupils, alignment, movement, visual fields, extinction

Figure 1: Recruitment flowchart



Supplementary file 1

V-FAST Paramedic Vision Evaluation

Symptoms

From patient or their family: What do they report?
Reported a new problem with eyes/vision and/or dizziness or problems with balance
Is vision different between the 2 eyes? **Ask the person to cover each eye in turn.**
Have visual symptoms lasted >1 hour?
When did the most recent visual problems start?

Observations

	Are the lids different?
	Are pupils different sizes? (anisocoria)
	Do they have a squint? (eye turn)
	Are they closing one eye to focus?

Do they move their head position to try to see better?

Eye Alignment

Does one eye turn in
Does one eye turn out
Does one eye turn up
Does one eye turn down

Eye Movements

Use a spotlight to check the pupil position in both eyes. Then, using one finger ask the person to follow it into the 4 positions to extremes (below left), keeping their head still. Tips:

- If you cannot move your hand/arm fully to one side, e.g. wall on that side, turn the person's head towards you to test
- If person is confused/cannot understand to follow your finger, move your head side to side to check how they follow your face

Do both eyes move smoothly upwards?
Do both eyes move smoothly to the right?
Do both eyes move smoothly to the left?
Do both eyes move smoothly downwards?

Do one or both eyes appear to have nystagmus – wobbling eyes?

Reading

Ask the person to read the following text

Can you read this sentence without any problems?

Visual Fields

1) **Holding both of your arms out to the side, asking the person to look at your nose, slowly bring one finger from in from the periphery for all 6 positions (below left) in a random order.**
2) **Holding both arms up (one to each side) briefly raise one or two fingers of one hand and ask how any are seen, repeat in the 4 quadrant positions (below right)**
3) **Ask if they can see all parts of your face or if part or one side appears more blurred than the rest**

Tips:
If you cannot move your hand/arm fully to one side, e.g. wall on that side, turn the individuals head towards you to test

Visual Inattention / Extinction

1) **Asking the person to look at your nose, hold up two fingers (one from each hand) to the individual's right side and ask how many fingers they can see**
2) **Slowly move one finger across to the left side, keeping the other finger on the right side, asking again how many fingers they can see**
3) **Repeat to other side**

Tips:
- One finger may not be seen but individual may be aware it should be seen or alternately they are unaware and only see one
- Watch whether they ignore things to left or right side e.g. they miss that someone has approached them from one side

Example for testing left sided inattention/extinction

Are they ignoring or showing neglect or extinction to **left or to right** side

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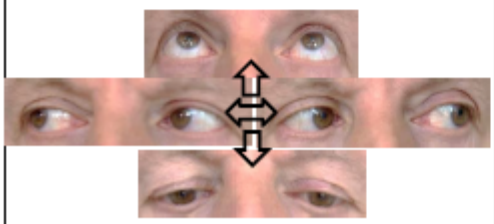
Supplementary file 2

V-FAST	Paramedic Vision Evaluation Checklist	
Case Number:	Patient Name:	D.O.B:
Symptoms		
From patient or their family: What do they report?	Reported a new problem with eyes/vision	Y / N
	Is vision different between the 2 eyes? **Ask the person to cover each eye in turn.**	Y / N
	Have visual symptoms lasted >1 hour?	Y / N
	Any dizziness or problems with balance?	Y / N
	When did the most recent visual problems start?	
Observations		
	Are the lids different?	Y / N
	Are pupils different sizes? (anisocoria)	Y / N
	Do they have a squint? (eye turn)	Y / N
	Are they closing one eye to focus?	Y / N
	Do they move their head position to try to see better?	Y / N
Eye alignment		
	Does one eye turn in	Y / N
	Does one eye turn out	Y / N
	Does one eye turn up	Y / N
	Does one eye turn down	Y / N
Eye movements		
Using one finger ask the person to follow it into the 4 positions to extremes (below left), keeping their head still **Tips:** - If you cannot move your hand/arm fully to one side, e.g. wall on that side, turn the person's head towards you to test - If person is confused/cannot understand to follow your finger, move your head side to side to check how they follow your face		
	Do both eyes move smoothly upwards?	Y / N
	Do both eyes move smoothly to the right?	Y / N
	Do both eyes move smoothly to the left?	Y / N
	Do both eyes move smoothly downwards?	Y / N
	Do one or both eyes appear to wobble (nystagmus)?	Y / N

Reading

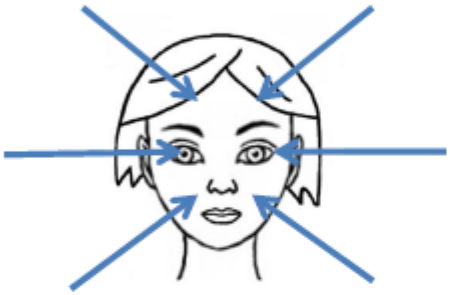
Ask the person to read the following text

Can you read this sentence without any problems?	Y / N

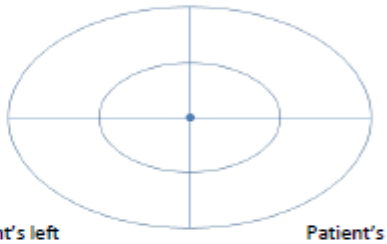
Visual fields

1) Holding both of your arms out to the side, asking the person to look at your nose, slowly bring one finger from in from the periphery for all 6 positions (below left) in a random order.
2) Holding both arms up (one to each side) briefly raise one or two fingers of one hand and ask how any are seen, repeat in the 4 quadrant positions (below right)
3) Ask if they can see all parts of your face or if part or one side appears more blurred than the rest
4) Draw findings on chart (below right), using hashed lines to indicate areas of visual field loss and ✓ to indicate areas where visual field appears normal

Tips:
- If you cannot move your hand/arm fully to one side, e.g. wall on that side, turn the individuals head towards you to test



Visual field normal Y / N



Visual inattention/extinction

1) Asking the person to look at your nose, hold up two fingers (one from each hand) to the individual's right side and ask how many fingers they can see
2) Slowly move one finger across to the left side, keeping the other finger on the right side, asking again how many fingers they can see
3) Repeat to other side

Tips:
- One finger may not be seen but individual may be aware it should be seen or alternately they are unaware and only see one
- Watch whether they ignore things to left or right side e.g. they miss that someone has approached them from one side

Example for testing left sided inattention/extinction

Are they ignoring or showing neglect or extinction to left side	Y / N
Are they ignoring or showing neglect or extinction to right side	Y / N

Recording on PRF Form

Recording on PRF Form:
If normal: record no abnormality evident on vision assessment
If **abnormal**: record the abnormality not the full assessment e.g. visual field reduced to right side, neglect to left side, right eye turns in, cannot see from left eye

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Supplementary file 3: VFAST training manual

Available from www.vision-research.co.uk