

26. Boland R, Hirschheim RA. Office Automation: A Social and Organizational Perspective, Wiley, Chichester. 1985.
27. Tzeng H-M, Titler MG, Ronis DL, Yin C-Y. The contribution of staff call light response time to fall and injurious fall rates: an exploratory study in four US hospitals using archived hospital data. *BMC Health Serv Res* 2012; 12: 84. <http://www.biomedcentral.com/1472-6963/12/84> (31 March 2012, date last accessed).

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# Delay between symptom onset and clinic attendance following TIA and minor stroke: the BEATS study

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## Abstract

**Background:** rapid specialist assessment of patients with transient ischaemic attack (TIA) reduces the risk of recurrent stroke. National guidelines advise that high-risk patients are assessed within 24 h and low-risk patients within 7 days.

**Aim:** to quantify delay and map pathways taken by patients from symptom onset to specialist assessment.

**Design:** retrospective cohort study.

**Setting:** rapid access TIA clinic.

**Methods:** structured interviews with 278 patients newly diagnosed with TIA (222) or minor stroke (56), and examination of medical records.

**Results:** of the 133 high-risk TIA patients, 11 (8%) attended the clinic within 24 h of symptom onset; of the 89 low-risk TIA patients, 47 (53%) attended within 7 days. Median delay between symptom onset and seeking help from a healthcare professional (HCP) was 4.0 h (IQR 0.5, 41.3). Delay was less if symptoms were correctly interpreted but not reduced by a publicity campaign (FAST) to encourage an urgent response. Most patients (156, 56%) first contacted a general practitioner (GP) and 46 (17%) called an ambulance or attended the emergency department. Over a third (36%) had a second consultation with an HCP before attending the clinic, and this was more likely in those presenting to paramedics, out of hours GP services or optometry. Time to clinic attendance was less if an emergency pathway was used and greater if patients were seen by a second HCP.

**Conclusions:** factors contributing to delay include incorrect interpretation of symptoms and failure to invoke emergency services. Delays after presentation could be addressed by direct referral by out of hours services, paramedics and optometrists.

**Keywords:** acute care, emergency medical services, stroke, transient ischaemic attack, general practice, older people

## Introduction

Rapid assessment and treatment of patients with transient ischaemic attack (TIA) or minor stroke reduces the risk of

early recurrent stroke [1, 2]. The Royal College of Physicians' Guidelines suggests that TIA patients should be scored using the ABCD<sup>2</sup> [3, 4]. Those at high risk (score  $\geq 4$ ) should be assessed by a specialist within 24 h of symptom onset, and

those at lower risk within a week. Implementation of this policy requires patients to seek help urgently from a health professional who applies the score, as well as effective mechanisms for referral.

Systematic reviews have highlighted delay due to lack of an urgent response to symptoms by patients [5, 6], but less research has been conducted on sources of delay between initial assessment by a health care professional (HCP) and specialist assessment.

We undertook the BEATS study to quantify delay at each stage in the pathway from symptom onset to specialist assessment. The study took place when publicity campaigns were promoting the 'FAST' test (Face or Arm weakness, Speech difficulty, Time to call 999) [7].

## Methods

Patients with a diagnosis of TIA or minor stroke (NIHSS score <8 [8]) attending a rapid access TIA clinic were invited to participate and, if they were willing, a time arranged for a structured interview in their home. Recruitment took place between 1 December 2008 and 30 April 2010.

The following time points were recorded at interview: symptom onset, seeking help, first consultation with an HCP, attendance at the TIA clinic and any additional contacts with HCPs before clinic attendance. Patients were questioned about the nature and duration of their symptoms, how they were interpreted and factors that may have affected their response. The following were obtained from the medical record: date and time seen, ABCD<sup>2</sup> score (for TIA), NIHSS score [9] (for stroke), neuroimaging diagnosis and history of stroke or TIA.

## Statistical analysis

Our planned sample size was 250 TIA patients to allow sufficiently precise estimates of delay. Medians and quartiles for delay were calculated using the Kaplan–Meier method. Cox proportional hazards modelling was used to compare delay times, with adjustment by diagnosis. Statistical significance was assessed at the 5% level.

## Results

During the study period, 929 patients were diagnosed with TIA or stroke in the clinic. Of these, 313 (34%) consented to take part. Thirty-five were excluded due to missing time-point data, unconfirmed diagnosis, and if the event occurred when they were a hospital in-patient. The final sample comprised 278 patients: 222 with TIA and 56 with stroke. Baseline characteristics are presented in Table 1. The median time between symptom onset and interview was 11 days.

Details of symptoms experienced, their duration, interpretation and action taken are presented in Table 2, which also shows which HCP was first contacted and which HCP patients initially assessed the patient. In some cases, this differed from the service first contacted; for example, a patient

**Table 1.** Demographic and baseline characteristics

	TIA ( <i>n</i> = 222)	Stroke ( <i>n</i> = 56)	Total ( <i>n</i> = 278)
Age (years), mean (SD)	71.1 (10.9)	68.9 (10.5)	70.7 (10.9)
Male sex, <i>n</i> (%)	119 (54)	35 (63)	154 (55)
Living alone, <i>n</i> (%)	49 (22)	13 (23)	62 (22)
Employment status, <i>n</i> (%)			
Employed	36 (16)	14 (25)	50 (18)
Unemployed	6 (3)	4 (7)	10 (4)
Retired	178 (80)	36 (64)	214 (77)
Other	2 (1)	2 (4)	4 (1)
Ethnicity, <i>n</i> (%)*			
White	212 (96)	54 (96)	266 (96)
Asian	9 (4)	2 (4)	11 (4)
IMD quintile, <i>n</i> (%) <sup>†</sup>			
1. 1–6	70 (32)	12 (21)	82 (30)
2. 7–8	31 (14)	8 (14)	39 (14)
3. 9–11	35 (16)	11 (20)	46 (17)
4. 12–19	43 (20)	15 (27)	58 (21)
5. ≥20	41 (19)	10 (18)	51 (18)
Risk factors, <i>n</i> (%)			
Current smoker <sup>‡</sup>	29 (13)	14 (25)	43 (16)
BP-lowering therapy <sup>‡</sup>	124 (57)	31 (56)	155 (57)
Cholesterol-lowering therapy <sup>‡</sup>	62 (29)	13 (24)	75 (28)
Atrial fibrillation <sup>‡</sup>	16 (7)	3 (5)	19 (7)
Previous known stroke/TIA <sup>†</sup>	45 (21)	11 (20)	56 (21)
NIHSS score, median (IQR)	N/A	1.5 (1, 2)	
ABCD <sup>2</sup> score ≥4 <i>n</i> (%)	133 (60)	N/A	

IMD quintile refers to 1 (least deprived) to 5 (most deprived). SD, standard deviation; IQR, interquartile range; NIHSS, National Institute of Health Stroke Scale; N/A, not applicable; IMD, index of multiple deprivation; BP, blood pressure.

\*221 in TIA group.

<sup>†</sup>215 in TIA and 55 in stroke group.

<sup>‡</sup>216 in TIA and 55 in stroke group.

<sup>†</sup>220 in TIA group.

phoning a general practitioner (GP) could be advised to call an ambulance.

Of the 263 patients who did not go directly to the emergency department (ED), 94 (36%) consulted a second HCP before attending the TIA clinic, as shown in Supplementary data are available in *Age and Ageing* online, Table S1. Of the 164 patients who first consulted a GP during working hours, 31 (19%) had a second consultation before attending the clinic, but this applied to 20 (45%) of patients first assessed by paramedics, 11 (73%) of those first seen by an out of hours GP and all those presenting first to an optometrist.

Of the 133 high-risk TIA patients, 11 (8%) attended the clinic within 24 h of symptom onset. Of the 21 who initially called an ambulance, 4 (19%) attended within this time frame, as did 2 of the 5 (40%) of those who initially attended ED. Of the 89 low-risk TIA patients, 47 (53%) attended within 7 days.

Supplementary data are available in *Age and Ageing* online, Table S2 show delay times. For all patients, the median (IQR) times in hours were as follows: symptom onset to seeking help: 4.0 (0.5, 41.3), initial assessment to clinic attendance: 53.4 (27.9, 136.2), symptom onset to clinic attendance: 93.8 (47.0, 197.8). The only patient variable associated with

**Table 2.** Symptoms reported, duration, interpretation and action taken and day of onset

	TIA (n = 222)	Stroke (n = 56)	Total (n = 278)
<b>FAST symptoms</b>			
Facial weakness	23 (10)	11 (20)	34 (12)
Arm weakness	38 (17)	8 (14)	46 (17)
Speech	98 (44)	23 (41)	121 (44)
Any FAST	133 (60)	33 (59)	166 (60)
<b>Non-FAST symptoms</b>			
Sensory loss only	54 (24)	15 (27)	69 (25)
Leg weakness	20 (9)	6 (11)	26 (9)
Vision	61 (27)	10 (18)	71 (26)
Other	127 (57)	35 (63)	162 (58)
Motor symptoms	48 (22)	9 (16)	57 (21)
<b>Symptom duration</b>			
<10 min	72 (32)	3 (5)	75 (27)
10–59 min	56 (25)	6 (11)	62 (22)
1–24 h	73 (33)	14 (25)	87 (31)
>24 h	20 (9)	31 (55)	51 (18)
Cannot remember	1 (0)	2 (4)	3 (1)
<b>Day of symptom onset</b>			
Monday	24 (11)	11 (20)	35 (13)
Tuesday	31 (14)	10 (18)	41 (15)
Wednesday	31 (14)	7 (13)	38 (14)
Thursday	34 (15)	4 (7)	38 (14)
Friday	34 (15)	6 (11)	40 (14)
Saturday	30 (14)	9 (16)	39 (14)
Sunday	37 (17)	9 (16)	47 (17)
<b>Perception of urgency</b>			
Medical emergency	32 (14)	4 (7)	36 (13)
Urgent, but not emergency	27 (12)	5 (9)	32 (12)
Seek help (same day)	42 (19)	11 (20)	53 (19)
Seek help (few days)	26 (12)	14 (25)	40 (14)
Seek help (within 1 week)	4 (2)	2 (4)	6 (2)
Mention at next planned appointment	20 (9)	4 (7)	24 (9)
No action required	46 (21)	7 (13)	53 (19)
Other person sought help	24 (11)	6 (11)	30 (11)
'No condition to judge' or missing data	1 (1)	3 (5)	4 (1)
<b>Thought due to stroke/TIA</b>			
Yes	88 (40)	21 (37)	109 (39)
No	133 (60)	35 (63)	168 (60)
Missing	1 (0)	0 (0)	1 (0)
<b>Involvement of other lay person</b>			
Yes	172 (77)	46 (82)	218 (78)
If Yes, then increased urgency	60 (35)	17 (37)	77 (35)
If Yes, then view not altered	96 (56)	22 (48)	118 (54)
If Yes, then reduced urgency	0 (0)	1 (2)	1 (0)
If Yes, then other person acted	16 (9)	5 (11)	21 (10)
Missing	0 (0)	1 (2)	1 (0)
<b>What medical help did you seek?</b>			
Rang NHS Direct <sup>a</sup>	6 (3)	4 (7)	10 (4)
Rang GP (working hours)	114 (51)	33 (59)	147 (53)
Rang GP (out of hours)	7 (3)	2 (4)	9 (3)
Went to emergency department	9 (4)	4 (7)	13 (5)
Rang 999	30 (14)	7 (13)	37 (13)
Optometrist	13 (6)	1 (2)	14 (5)
GP when next visiting	11 (5)	3 (5)	14 (5)
Went to walk-in centre	6 (3)	0 (0)	6 (2)
Other made contact	3 (1)	0 (0)	3 (1)
Other	23 (10)	2 (4)	25 (9)
<b>First HCP contact</b>			
Emergency Department	10 (5)	5 (9)	15 (5)
Paramedic	38 (17)	6 (11)	44 (16)

Continued

**Table 2.** Continued

	TIA (n = 222)	Stroke (n = 56)	Total (n = 278)
NHS Direct <sup>a</sup>	5 (2)	4 (7)	9 (3)
GP (working hours)	128 (58)	36 (64)	164 (59)
GP (out of hours)	13 (6)	2 (4)	15 (5)
Optometrist	11 (5)	1 (2)	12 (4)
Nurse	5 (2)	1 (2)	6 (2)
Other or missing	12 (5)	1 (2)	13 (5)

Data are presented as n (%). Percentages might not add up to 100% because of rounding. GP, general practitioner.

<sup>a</sup>NHS Direct is a telephone advice line for patients. FAST, Face Arm and Speech Test.

reduced delay in seeking help was if patients interpreted symptoms as due to stroke or TIA.

Time between symptom onset and clinic attendance differed according to health professional first consulted: the median following consultation with the patient's own GP was 97 h, 48 h if a paramedic was called, 44 h if the patient attended ED and 70 h if an out of hours GP was consulted. The greatest delays (median 220 h) were seen in patients who first presented to an optometrist. Delays were also greater when a second HCP was consulted.

## Discussion

Factors contributing to delay include incorrect interpretation of symptoms and failure to invoke emergency services, demonstrating an ongoing need for patient education. Only 60% of patients reported a 'FAST' symptom, fewer than in other studies [10, 11]. The test was designed to assist diagnosis [7] and may need further development as a tool for public education, especially for minor stroke and TIA when symptoms are mild and transient [10].

We also found that service factors contributed to delay in referral. Most patients who consulted an out of hours GP, and all who consulted an optometrist experienced a further consultation before clinic attendance, usually with their GP. Additionally, almost a half of patients who contacted a paramedic had a further consultation. Services could be streamlined to encourage clinic referral by these professionals [12, 13]. Our findings also suggest that referral pathways from ED and the acute medical unit could be improved, as only a minority of high-risk TIA patients who attended were seen in the clinic within 24 h. In summary, patients are encouraged to respond urgently to symptoms, but when they do so, a significant number are then referred back to their GP.

Study limitations include the fact that it was conducted in a single centre and included only patients attending a TIA clinic, and so care needs to be taken in generalising findings to other settings. Additionally, there may have been selection bias and problems of recall by patients.

Future campaigns need to focus more on symptoms as experienced and interpreted by patients, and to give a clear message about how and from whom to seek urgent help.

Effective referral routes need to be established in primary and emergency care to enable direct and timely access to specialist clinics.

### Key points

- Only a minority TIA patients are assessed by a specialist within the timeframe recommended by NICE.
- Patient delay and uncertainty remains a problem, despite the recent FAST campaign.
- Delays between initial consultation and specialist could be addressed by streamlining referral pathways.

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### Author contributions

A.W. is guarantor of the paper. He and T.R. designed the study and obtained funding. D.C. coordinated the study, conducted the interviews, extracted data from the clinical records and contributed to the qualitative analysis. N.T. and C.W. designed and conducted the statistical analysis. All authors have commented on earlier drafts of the paper.

### Conflicts of interest

None declared.

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### Supplementary data

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

### References

1. Rothwell PM, Giles MF, Chandratheva A *et al.* *Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison.* *Lancet* 2007; 370: 1432–1442.
2. Lavallée PC, Meseguer E, Abboud H *et al.* *A transient ischaemic attack clinic with round-the-clock access (SOS-TLA): feasibility and effects.* *Lancet Neurol* 2007; 6: 953–960.
3. Intercollegiate\_Stroke\_Working\_Party. *National Clinical Guideline for Stroke*, 3rd edition. London, 2008.
4. Galvin R, Geraghty C, Motterlini N, Dimitrov BD, Fahey T. *Prognostic value of the ABCD<sup>2</sup> clinical prediction rule: a systematic review and meta-analysis.* *Family Practice* 2011; 28: 366–376.
5. Sprigg N, Machili C, Otter ME, Wilson A, Robinson TG. *A systematic review of delays in seeking medical attention after transient ischaemic attack.* *J Neurol Neurosurg Psychiatry* 2009; 80: 871–875.
6. Lecouturier J, Rodgers H, Murtagh M, White M, Ford G, Thompson R. *Systematic review of mass media interventions designed to improve public recognition of stroke symptoms, emergency response and early treatment.* *BMC Public Health* 2010; 10: 784.
7. Harbison J, Hossain O, Jenkinson D, Davis J, Louw SJ, Ford GA. *Diagnostic accuracy of stroke referrals from primary care, emergency room physicians, and ambulance staff using the face arm speech test.* *Stroke* 2003; 34: 71–76.
8. DeGraba TJ, Hallenbeck JM, Pettigrew KD, Dutka AJ, Kelly BJ. *Progression in acute stroke: value of the initial NIH stroke scale score on patient stratification in future trials.* *Stroke* 1999; 30: 1208–1212.
9. Schlegel D, Kolb SJ, Luciano JM *et al.* *Utility of the NIH stroke scale as a predictor of hospital disposition.* *Stroke* 2003; 34: 134–137.
10. Bray JE, O’Connell B, Gilligan A, Livingstone PM, Bladin C. *Is FAST stroke smart? Do the content and language used in awareness campaigns describe the experience of stroke symptoms?* *Int J Stroke* 2010; 5: 440–446.
11. Kleindorfer DO, Miller R, Moomaw CJ *et al.* *Designing a message for public education regarding stroke: does FAST capture enough stroke?* *Stroke* 2007; 38: 2864–2868.
12. Cameron JR, Ahmed S, Curry P, Forrest G, Sanders R. *Impact of direct electronic optometric referral with ocular imaging to a hospital eye service.* *Eye*, 2008; 23: 1134–1140.
13. Stroke\_Improvement\_Programme. *Going up a gear: practical steps to improve stroke care.* NHS Improvement, Leicester, 2010.

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