Decisions and delays within stroke patient’s route to hospital: a qualitative study

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Authors’ contributions

Had the original idea: All authors

Designed the study: RMM SB SG RJM AB PC

Conducted the interviews: SB RMM AB

Analyzed the data: SB RMM performed initial thematic analyses which were developed with RJM

Drafted the manuscript: RMM. All authors contributed substantially to its revision and agreed the final version.

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Abstract

Objective: To examine acute stroke patients’ decisions and delays en route to hospital following onset of symptoms.

Methods: Qualitative study carried out in the West Midlands, UK. Semi-structured interviews were conducted with 30 patients (six accompanied by partners). Patients were asked about their previous experience of having had a stroke and their initial engagement with health services. ‘One sheet of paper’ and thematic analyses were used.

Results: Three potential types of delay were identified from onset of symptoms to accessing stroke care in hospital: Primary delays due to lack of recognition of symptoms or not dealing with symptoms immediately; Secondary delays due to initial contact with non-emergency services; and Tertiary delays where health service providers did not interpret the patient’s presenting symptoms as suggestive of stroke. The main factors determining the speed of action by patients were the presence and influence of a bystander and the perceived seriousness of symptoms.

Conclusion: Despite campaigns to increase public awareness of stroke symptoms, the behaviour of both patients and health service providers apparently led to delays in the recognition of and response to stroke symptoms potentially reducing access to optimum and timely acute specialist assessment and treatment for acute stroke.
Introduction

Background
Stroke is a leading cause of morbidity and mortality worldwide with an estimated 5.7 million deaths and approximately 50 million disability-adjusted life years (DALYs) lost every year.[1] Urgent treatment with intravenous thrombolysis using alteplase for acute ischaemic stroke can markedly improve patient outcomes for eligible patients. Timely access to therapy depends on early recognition of symptoms by patients and health service providers, facilitating prompt arrival in hospital, accessing specialist assessment and treatment, ideally as soon as possible after symptom onset, and within the ‘therapeutic window’ of 4.5 hours.[2-4]

There is wide variation in the proportion of people with symptoms of stroke who contact the Emergency Medical Services (EMS) (19-58%) as opposed to other health service providers such as Family Practitioners (FPs).[5-8] Delays at any stage of the care pathway can have a major impact on the proportion of patients that receive timely assessment and treatment in hospital.[9-12]

Importance
Previous work has shown that those who do not call the EMS are delayed in arriving at hospital and has principally considered the way in which recognition of symptoms influences initial help seeking behaviour.[13-17] Similarly public health campaigns have concentrated on the recognition of the symptoms of stroke and the importance of promptly calling the EMS.[18]

In the UK, as with other health services, patients’ first contact with health services can be either calling the EMS, directly attending the hospital Emergency Department (ED) (see figure s1, online appendix), or contacting Primary Care (via non-emergency telephone triage service, or direct contact with a Family Practice or Walk in Centre). Subsequent transportation alternatives include ambulance and private or public transport. No previous studies have addressed how patients navigate through these multiple options or their experiences when first contact with the health service does not result in immediate transfer to hospital.
**Goals of the investigation**

This study aimed to understand through patients’ narratives, how decisions are made and delays occur en route to hospital following the onset of stroke symptoms.

**Methods**

**Study design and setting**

This qualitative study was part of a larger mixed programme of work which recruited patients with stroke who attended two urban hospitals within the West Midlands, UK[19] with an ethnically diverse catchment population. Both participating hospital Trusts offered a 24 hour thrombolysis service, seven days a week, but in the case of the second Trust, this was achieved by combining an ‘in hours’ service, 9am to 5pm, Monday to Friday in the lead hospital with out-of–hours care at a separate site. A summary of the patient pathway for acute stroke in the UK is detailed in the online supplemental material (Online supplement, figure s1). At the time of the study, a 4.5 hour maximum time window for thrombolysis was in operation. The prevalence of stroke in West Midlands is estimated to be in the region of 17 per 1,000 population, similar to national rates.[20]

**Selection of participants**

Participants were purposively recruited on the basis of their route to hospital and demographic characteristics (gender, age and ethnicity). Patients who had suffered a stroke within the last six months were contacted either directly on the ward or by invitation letter post-discharge from hospital. Patients were excluded if they: had previously stated they did not want to be contacted about the interview study; required a consultee to consent for them; were non-English speakers; or were unable to communicate (e.g. severe aphasia). Participant characteristics were collected from the patients and/or their hospital records.
Conducting interviews

Following informed consent, semi-structured interviews using a topic guide (online appendix A) were conducted by four female interviewers, each trained in qualitative methods, who were not part of the patients’ health care team. The topic guide was developed by the study team, with the first draft based on information gained from reviewing the literature, but then was influenced by data coming out from the interviews, for example asking specifically about awareness of a stroke campaign, as well as generally about their prior knowledge of stroke. Where present, partners were invited to participate to fill in any gaps in patients’ accounts, with the emphasis of the interview on patients’ accounts. Patients were asked about their experience of having an acute stroke and of health services, with particular emphasis on their route to hospital.

Patients chose their interview setting and were interviewed once, with the exception of one participant who received a follow up interview. Interviews were conducted between January 2011 and July 2013, and ranged from 15 minutes to two hours in length, mean 46 minutes. Interviews were audio recorded and transcribed verbatim. Field notes were recorded at the end of each interview and similarly transcribed.

Analysis

Transcripts were checked for completeness and accuracy. NVivo 9 (QSR International)[21] was used to manage the data. Researchers took an interpretivist approach to data analysis acknowledging that patients were recalling their perspectives of their experience rather than the ‘empirical truth’, and with the knowledge that they had suffered a stroke.

Initial analysis was conducted using the ‘one sheet of paper’ (OSOP) method, where for the first interviews all the points raised about patients route to hospital within each interview were noted on a sheet of paper, along with the participants’ pseudonym.[22] This allowed the points to be grouped and summarised and provide a basis for development of the main themes. It gave insight into variation in responses between interviews and how themes linked together.
This OSOP provided the structure for further analysis, onto which the rest of the interview data was added, as it was collected. A constant comparison analysis approach was taken, where sections of data were compared to establish differences and similarities.[23] Analysis was conducted at the individual level and by initial health service provider contacted. This provided the components of the three themes outlined below. To ensure analytical rigour, both SB and RMM coded and double coded a sub-set of interviews, meeting regularly to compare findings and resolve differences through discussion.

Further to this RMM and RJM reviewed summary data, discussed it in the light of the literature and clinical experience and referred back to the original transcripts to ensure emerging interpretation remained grounded in the original data and through this process the final delay categorisation was reached. Interviews ceased when data saturation was reached – that is that no new theme emerged. This happened after 30 interviews had been carried out. This is consistent with the recommended sample size to allow for saturation to be achieved in this type of study.[24, 25]

Participants have been sent a lay summary of all study findings but member checking, either of the study or their individual transcripts has not been conducted. Quotations give patients’ gender, age and initial service contacted.

**Ethics statement**

The London-Queen Square Research Ethics Committee (09/H0716/71) approved this study.

**Results**

**Characteristics of the study subjects**

Thirty stroke patients were interviewed, including six with their partner. They all lived in an urban area and the majority of interviewees were men (n=22), White British (n=26), aged under 65 years (n=18) and had their strokes at home (n=25)
Table 1). Just over half (n=18) contacted one service prior to getting to the ED and then stroke treatment; the remainder had more circuitous routes. Just under half (n=15) arrived within 3 hours of the onset of the symptoms, but many (n=11) had no onset time recorded in their hospital records.

Main results

Delays en route to hospital were defined at three levels on the acute stroke pathway:

- **Primary delays**: a lack of recognition of stroke-serious symptoms and/or lack of response to these symptoms.
- **Secondary delays**: initial contact with non-emergency health services (e.g. making an appointment with the FP rather than calling the EMS)
- **Tertiary delays**: Patient’s presenting symptoms were not initially interpreted as indicating a stroke by the health service provider (e.g. a FP or the EMS)

Patients could potentially be subject to one, two or all three levels of delay. The flow of decisions from onset of symptoms until hospital arrival is summarised in Figure 1.

Primary delays

Primary delays, the lack of recognition of stroke and/or lack of response to those symptoms were influenced by bystanders and the perceived seriousness of those symptoms.

Influence of bystanders

Bystanders (family members, friends, work colleagues) were frequently mentioned in accounts of the route to treatment. They became involved because: they were present at the time; the patient sought them out; the patient saw them by chance; or they recognised symptoms that the patient was unaware of.

Patients frequently (n=11) reported seeking advice or help from friends, family or others present at the time, to confirm that something was wrong and determine necessary action.
I managed to get on the side of the bed and lift myself up and then I just fell back and I managed to ring... I rang my brother (Man, 32, walked into the ED)

In other instances (n=12) patients were not aware or resisted the idea that something was seriously wrong and it took another bystander(s) to persuade or “force them” into seeking help.

I said “no, no, I’m all right, I’m all right”. And they sort of bullied me into taking me to [hospital name]... I was angry because I mean the girls had persuaded me, or forced me to go into hospital and I didn’t want to go into hospital, let alone be kept overnight. (Man, 65, walked into the ED)

Several factors affected whether bystanders, were able to influence the patient to seek help: the patient’s relationship with them; whether they were seen to have some ‘medical knowledge’; their perception of the patient’s ability to make a decision at that time; and their level of pro-activeness in the situation.

In a minority of accounts (n=8), a bystander delayed the help seeking process. Implicit reasons for this were: not wanting to take responsibility for the decision, rather contacting someone else who they viewed able to do it (for example, calling the patient’s daughter rather than EMS directly); perceiving situation to be less urgent or serious than the patient; or misinterpreting the symptoms and thinking the situation was not serious (for example, thinking the patient was intoxicated).

Some patients, were alone at the time of symptom onset (n=5). Depending on the severity of symptoms, such individuals were able to decide whether they wanted to seek help themselves, or had to wait for someone else to assist. They may not have had the physical or practical ability, or mental clarity to contact services and communicate their symptoms on their own.
I was putting the groceries away and I fell...He [brother] came [to visit] unexpectedly... otherwise I would have lain there, you know, for a long time.

(Woman, 85, called the EMS)

**Perception of seriousness of symptoms**

Patients were influenced in their actions by their perception of the seriousness of the symptoms. Moderate symptoms were described as feeling weird/dizzy/headache or migraine; whereas patients who reported limb numbness or facial droop often reported that their symptoms were serious. People who felt the symptoms were serious called either the EMS, made their own way to hospital, or telephoned a non-emergency telephone triage service to confirm the significance.

He said the room was spinning round, and I said well ‘do you want me to call the doctor?’ ‘no’ was his answer again... and on the third occasion, when he does do it again, he comes back into the room, tries to sit on the bed and, whether he didn’t see the bed, or he thought it was there, and the next thing, he’s on the floor... I said this is ridiculous; I’m going to call the doctor.

(Man’s wife, 66, non-emergency telephone triage service)

Symptoms were not perceived to be serious if: a patient thought they could ‘self-medicate’, for example going to bed and taking painkillers; they could relate it to a previous illness which had not been serious; if they were in denial; or if their judgement had been clouded. Some younger patients (under 65 years) reported that they thought they were too young to have a stroke, therefore their symptoms could be attributed to something less serious i.e. a migraine.

I came downstairs and I was met with [work colleagues] who said I’d got a migraine. I’ve never had a migraine before and so I thought you know that that’s pretty plausible and I’ll just go home.

(Man, 37, walked into the ED)
Secondary Delays

Secondary delays, initial contact with a non-emergency health service, were influenced by uncertainty around the seriousness of the symptoms, previous hospital experience, and ease of access to services.

Contacted the wrong service

Ideally patients would contact the EMS to take them immediately to hospital but some arranged private transportation to hospital.[26] A minority (n=5) initially contacted non-EMS health service providers, who were unable to treat or provide directly access to treatment for symptoms of stroke: non-emergency telephone triage service, Family Practice, and Walk-In Centre. Non-EMS providers could refer to a more appropriate service.

The bystander below contacted the non-emergency telephone triage service to confirm the seriousness of the symptoms which resulted in a physician call back, delaying the EMS call. Similarly access to Family Practice could result in an initial delay if stroke symptoms were not recognised when booking an appointment.

So I called national health helpline, we had a good discussion... they said they would ring us back, which they did, and a doctor spoke to me and said yes, call an ambulance straight away, which we did. (Man’s wife, 66, non-emergency telephone triage service)

Previous hospital experience

Previous experience of hospitalisation could affect desire to attend. One patient had reported a good hospital experience which reinforced his choice to travel to hospital, however another reported a particularly unpleasant recent stroke experience, which contributed to her convoluted route: after initially calling EMS she did not utilise the ambulance that arrived, rather waiting a day before going to her FP.
We got the ambulance again on Sunday night, and the driver said ‘oh how are you feeling [patients’ name]? you know, you’re looking all right’, and I said ‘yes, I feel not too bad actually’, and I did not want to go and spend another night in that horrible ward, so I said I’d stay at home and see.  (Woman, 77, called the EMS)

Ease of access to services
One patient delayed accessing services as they already had a Family Practice appointment booked. Other patients gave specific reasons for making their own way into hospital as opposed to calling the EMS: going by car would be faster, that it would be easier as there was a car on hand. Some had not considered calling the EMS, whilst others were concerned about wasting health service resources.

Tertiary Delays
Tertiary delays, where health care providers did not initially interpret the patient’s presenting symptoms as serious or suggestive of stroke, could occur within the Emergency Health Service or within Primary Care and result in multiple providers being involved prior to the patient getting appropriate treatment.

Emergency health service tertiary delays
Most patients (n=25) contacted the EMS or made their own way to the ED, which should have led to urgent treatment. In a minority of cases (n=3) participants reported that EMS providers did not interpret their presenting symptoms as serious or suggestive of stroke. As noted earlier there was one instance when an ambulance crew was involved in the patient’s decision not to go to hospital. Two patients reported that the EMS Operations Centre suggested they contact their Family Practice. These instances were unusual: one was ill on New Year’s Eve and one had stated to the EMS Emergency Operations Centre that he was an alcoholic (in addition to suggesting that he was having a stroke). Furthermore conveying information over the telephone potentially leads to poor understanding of symptoms.
Then I rang the 999 [EMS] straightaway which in turn put me onto the ambulance station, who told me to go and ring the mobile doctor which I contacted. He said ‘well he’s on his way, but he won't be coming for some time yet and it could be two hours’ (Woman’s husband, 78, called the EMS)

Two men reported being misdiagnosed in the ED and leaving the hospital rather than being admitted. Hospital staff had thought it was a less serious diagnosis, i.e. virus. Both returned to the ED later. As discussed below, although the patient felt his symptoms were serious, he was concerned about being a ‘bad patient’, questioning the doctor, and this created reluctance (which he overcame) to seek further care.

It was playing with my head because I didn't want to waste anybody's time or thinking that I'm like a hypochondriac: ‘You know this guy he's coming but he’s not letting the medication sort of take its course or anything’, but it wasn't improving and I was getting worse... (Man, 39, called the EMS)

**Primary Care Tertiary delay**

Whilst some Primary Care physicians immediately called EMS on recognising individuals with symptoms of stroke, others did not organise an emergency admission. Patients who did not get a sense of urgency from Primary Care could delay further. The patient below refused the offer of an ambulance and delayed her hospital attendance so as to cancel her exercise class. Her example is both a primary and tertiary delay, as she deviated from her advised immediate hospital attendance, earlier reporting she did not perceive the symptoms to be serious or urgent, but also a tertiary delay as the nurse involved did not insist on using the EMS.

[Nurse] said ‘I'm going to write a note and I'm going to phone them and say you're on your way’. I said ‘but I've got to let them know at Tai Chi because they'll wonder what's happening and it's only round the corner at [name of road]’. She says ‘you need to go now’. I said ‘oh, all right’... And then when I
got outside I thought I've got to let them know at Tai Chi, so I walked from [Name of Walk-In Centre], round [to Tai Chi class] (Woman, 57, Walk in Centre)

Three patients attended the FP between one day and two weeks after the initial stroke. This delay might have influenced the FP’s decision not to insist upon EMS use. In one case the FP had concerns about the patient’s general health thus advised against hospital attendance in case the patient caught an infection. One was given the choice of an ambulance or to make his own way to hospital, he chose to use public transport. The other patient was told to go to hospital, and asked if he was able to get there. However the patient’s means of transport required him to walk home and get his neighbour to drive him to hospital. He attributes this decision to use private transport as the best use of resources, due to lack of certainty over his diagnosis. From his account it would appear that he did not disclose to the FP the convoluted route that he would take to hospital.

She [Family Practitioner] wrote me a letter and sent me straight down to the hospital...

**The doctor didn’t suggest calling an ambulance?**

No, because I don’t think she was sure that I’d actually had a stroke. I’m sure she suspected, she did ask me did I have somebody with me, and did I have a means to get to the hospital, and I had, you know [walking home with his wife and neighbour driving him]. Ambulances are for people who really need them.

(Man, 51, Family Practice)

Whenever services redirect, the decision on how to proceed depended on patient and/or bystander response. Sometimes this led to a more convoluted route to hospital, with two or more services contacted (either the same or a different service) prior to getting to the ED.
Limitations

Patients with a final diagnosis of stroke were purposively recruited according to the initial health service provider contacted, upon onset of stroke symptoms (identified during data collection for the larger observational study).[19] However, despite purposive mail outs, it was difficult to recruit those who used non-EMS routes and recruitment was dependent on patients responding to written requests for participation. Similarly, fewer women agreed to be interviewed and patients who required consultee consent, could not speak English, with severe aphasia, or were too ill or had died were excluded from the study, so their perspectives are not represented. As the sample was restricted to those with a final diagnosis of stroke, excluding those with symptoms of stroke but a different diagnosis, it is not possible to comment on the implications for their treatment, where a less urgent response may be more appropriate. Similarly, those with more severe stroke were less likely to be included and may have had different experiences. It is also possible that patients with less positive health service experiences might have been more likely to agree to be interviewed as they wanted to be able to tell their story.

Whilst patients were recruited from a limited sample of two hospitals, the local stroke services available were reflective of current national practice.[27] Healthcare organisation varies from country to country but the ability to call an ambulance or instead contact another healthcare provider is common to most Western countries and hence the delays considered here are widely relevant albeit potentially from differing providers in different countries. For example, an HMO might require initial contact with a triage service in some circumstances, potentially leading to delays should a patient or triage officer not recognise their symptoms immediately.

A further limitation was that some patients had difficulty recalling the details of their route to hospital. Reasons for this included: conducting the interview several weeks after the event and patients being asked about a time when they were not well and hence impairing recollection. Furthermore, by the time of interview, participants had been diagnosed with stroke and this knowledge may have influenced their perceptions of their earlier memories. The presence of partners in six of the interviews may have influenced how patients presented their narratives,[28]
however it assisted in filling gaps, as patients could have gaps in their memories and their presence was nice in terms of moral support.[29] Furthermore in the case of all partners, they had been present in patients route to hospital.

Discussion

Summary of results

Patients experienced a range of pre-hospital delays: 1) primary delays due to lack of stroke recognition or appropriate response to them; 2) secondary delays due to initially contacting a non-emergency health service; and 3) tertiary delays where the health service did not recognise the stroke. Key to patient decision making and primary and secondary delays was the presence and influence of significant bystanders, who could expedite or delay access to treatment. Decisions to choose a certain route were influenced by the perception of the seriousness of symptoms, previous hospital experience and ease of access to services. Tertiary delays were influenced by whether the health service provider interpreted the patient’s presenting symptoms as serious or suggestive of stroke.

How results relate to other literature

Previous studies have focused on primary, patient related, delays slowing down stroke patients’ route to hospital.[16, 17] The present study highlights that delays can occur on a number of additional levels, including secondary delays due to initial misdirection, and tertiary delays related to the health service. Even where patients reacted immediately and contacted appropriate services, misdirection by health service providers had significant impact. Previous studies have noted that some Family Practices can delay patients getting to hospital by organising a home visit[30] or by not arranging for the patient to be taken nor stressing the urgency of getting to hospital.[15] This study has found additional sources of delay further along the stroke pathway, up to and including the ED.
This study highlighted the importance of bystanders in primary and secondary decisions in the route to hospital, mostly in a positive way, although some of our patients actively resisted bystanders making decisions. Mackintosh et al[15] reported patients using bystanders to avoid taking responsibility and generally causing delay. They perceived bystanders contacting the EMS, so that the responsibility was removed from them. Moloczji et al, Jones et al, and Harrison et al[16, 17, 30] also reported negative instances.

The present study highlights the range and importance of patients’ perceptions of symptoms. Mackintosh et al [15] reported a range of perceptions, with some patients ignoring symptoms in the hope that they would ‘go away’, and finding that patients where the symptom onset was not dramatic might delay seeking attention. Moloczji et al [17] emphasised the importance of feeling pain, and how the lack of this in most stroke patients could result in initial contact with non-emergency services. Quantitative studies have linked neurological severity with delay to arriving to hospital.[13, 14, 31, 32]

Our findings and the stroke-specific literature has striking similarities to the findings of studies over several decades of help-seeking behaviour among people experiencing acute myocardial infarction. For example, Kirchenberger et al.[33] found misinterpretation of symptoms of heart attack to be associated with delaying the call for help. Dubayouva et al.[34] reported from their systematic review that intensity of fear was associated with earlier help-seeking. Classic studies from Nottingham, UK[35] and Rotterdam, The Netherlands[36] reported significantly longer delays in hospitalisation and initiation of reperfusion therapies where patients sought advice from their primary care physician rather than calling an ambulance.

Implications for health care professionals and patients

The decision by health service providers on how best to respond to initial patient presentation is crucial, and is often made by receptionists or ambulance dispatchers. The present study highlights the importance of non-emergency services in directing patients towards emergency care in acute stroke. FPs should emphasise the urgency
of ED attendance and arrange ambulance transportation when referring suspected stroke patients to hospital. Pre-warning hospitals or providing a patient referral letter to expedite the patient journey to hospital following initial ‘secondary delays’ (and in some cases ‘primary’ delays) may not be as effective as ambulance pre-alerting.[12, 37, 38] Further training in stroke recognition should be considered for non-clinically staffed, ‘non-emergency’ telephone services to avoid secondary delays being compounded leading to worse outcomes. This is particularly important given that only 3% of EMS calls for stroke include more than one FAST symptom.[39]

Although a balance needs to be struck, to ensure service providers do not become overly risk averse and send too many patients to emergency care which could overload the system. Patients may not be the best judges of the seriousness of their symptoms, therefore bystanders can be extremely important in their seeking care. Campaigns could encourage members of the public to assist where symptoms of stroke are suspected. Furthermore, current campaigns aimed at ensuring the correct use of EMS, must be cautious not to dissuade people from seeking emergency care if they are uncertain whether their symptoms are serious. Members of the public should not be expected to always make the best decision during a medical crisis, rather the health service organisation should direct them appropriately, whatever the initial point of contact.[40]

Limited data from a recent systematic review of UK literature on awareness of and response to stroke symptoms revealed a good level of knowledge of the two commonest stroke symptoms (unilateral weakness and speech disturbance), and of the need for an emergency response among the general public and at risk patients. Despite this, less than half of patients recognised they had suffered a stroke. Symptom recognition did not reduce time to presentation. For the majority, the first point of contact for medical assistance was a Primary Care Physician.[41]

The English mass media campaign 'Act FAST' aimed to raise stroke awareness and the need to call emergency services at the onset of suspected stroke. While some stroke patients and witnesses reported that the campaign impacted upon their stroke recognition and response, the majority reported no impact. Clinicians often perceived campaign success in raising stroke awareness, but few thought it would
change response behaviours.[42] These findings were confirmed in a subsequent systematic review by the same research group.[43]

In summary, there are several points en route to hospital where patients or health service providers can potentially delay access, which will impact patients’ ability to get timely assessment and treatment. Patients have described delays caused by both themselves and health professionals who responded to their initial presentation. Bystanders appear to be important in the decision making processes both in terms of initiating action in the face of symptoms of stroke and in deciding what action to take. Future stroke public awareness campaigns should encourage members of the public to assist where signs of stroke are recognised and direct patients to emergency services. Potential delays caused by health professionals could be reduced through training for first point of contact health service providers (Family Practice receptionists, EMS dispatcher), to assist them in recognising symptoms and ensuring that patients with possible stroke are treated as emergencies.
Figure 1: Flowchart showing different responses to onset of stroke symptoms*

![Flowchart showing different responses to onset of stroke symptoms](image-url)

- **Acute event**
  - Interaction with bystander
  - Recognition of serious event or stroke
- **No recognition of serious event or stroke**
- **Decision to act**
  - Non-ambulance admission
  - Telephone contact with emergency services (Emergency Operations Centre)
  - Contact with non-emergency services
  - Primary care face to face
  - Telephone
- **Emergency Medical Service assessment (paramedics)**
- **Emergency Department assessment**

**Legend:**
- Green: Potential for primary delay
- Orange: Potential for secondary delay
- Blue: Potential for tertiary delay

**Direct route**
- Example path: Acute event → recognition of stroke → decision to act → contact with non-emergency service → primary care face to face → non-ambulance admission → emergency department assessment → stroke team
Table 1: Participant characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Interviewees (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
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</tr>
<tr>
<td>Female</td>
<td>8</td>
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<td><strong>Age</strong></td>
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</tr>
<tr>
<td>Range (years)</td>
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<td>&gt;65 years</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<td>Indian</td>
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<td>Pakistani</td>
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<tr>
<td><strong>Socio-economic status</strong></td>
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<tr>
<td>IMD 2007, Median, inter-quartile range</td>
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<tr>
<td><strong>Time of interview post-stroke</strong></td>
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<td>Range</td>
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<tr>
<td>Up to 3 months post-stroke</td>
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<tr>
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<td>Home</td>
<td>25</td>
</tr>
<tr>
<td>Work</td>
<td>3</td>
</tr>
<tr>
<td>Other: supermarket, in car</td>
<td>2</td>
</tr>
<tr>
<td><strong>Time from symptom onset to presentation at hospital</strong></td>
<td></td>
</tr>
<tr>
<td>≤3 hours</td>
<td>15</td>
</tr>
<tr>
<td>&gt;3 hours</td>
<td>4</td>
</tr>
<tr>
<td>Unknown onset time (as recorded in hospital records)</td>
<td>11</td>
</tr>
<tr>
<td><strong>Delay to contacting initial health service (primary delay)</strong></td>
<td></td>
</tr>
<tr>
<td>Delayed contacting health service</td>
<td>17</td>
</tr>
<tr>
<td>Immediately contacted service</td>
<td>13</td>
</tr>
<tr>
<td><strong>Initial health service contacted (secondary delay)</strong></td>
<td></td>
</tr>
<tr>
<td>Emergency Medical Services (EMS)</td>
<td>16</td>
</tr>
<tr>
<td>Made own way to hospital</td>
<td>9</td>
</tr>
<tr>
<td>Walk in centre/Family Practice</td>
<td>3</td>
</tr>
<tr>
<td>Non-emergency telephone triage service</td>
<td>2</td>
</tr>
<tr>
<td><strong>No. services contacted prior to getting to the Emergency Department and then stroke treatment</strong></td>
<td></td>
</tr>
<tr>
<td>1 service contacted</td>
<td>18</td>
</tr>
<tr>
<td>2+ services contacted</td>
<td>12</td>
</tr>
<tr>
<td><strong>At least one service provider on route to hospital did not recognise the seriousness of the symptoms and directed to an inappropriate or no service (tertiary delay)</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td>No</td>
<td>25</td>
</tr>
</tbody>
</table>
Reference list


[21] QSR International Pty Ltd. NVivo qualitative data analysis software. 9 ed 2010.


