



Health Services Safety
Investigations Body

Investigation report

Investigation report: Transfer of a patient who had suffered a stroke to emergency care - Local integrated pilot 3

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Emergency care

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Considerations in light of coronavirus (COVID-19)

A number of national investigations were in progress when the COVID-19 pandemic significantly affected the UK in 2020. Much of the work associated with developing the investigation reports necessarily ceased as HSIB's response was redirected.

For this national report, while the learning described has not changed due to COVID-19, the processes HSIB used to engage with staff had to be adapted. This included fewer face-to-face interviews and interactions and an increased use of virtual interviewing. Owing to the nature of this investigation there was no need to visit clinical areas to observe work in practice.

A note of acknowledgement

We would like to thank the Patient whose experience is documented in this report, and his family. At the time of writing the report, the Patient's family did not wish to be involved in the investigation but had given their permission for the investigation to go ahead. We would also like to thank the healthcare staff who engaged with the investigation for their openness and willingness to support improvements in this area of care.

Local integrated investigation pilot

This investigation has been published as part of HSIB's local integrated investigation pilot (local pilot). The local pilot was launched to evaluate HSIB's ability to carry out effective local investigations with actions aimed at specific trusts or hospitals, while still identifying and sharing relevant national learning. After evaluation, consideration will be given as to whether this model can be implemented more widely by HSIB.

This investigation report presents the findings of one of four investigations within the local pilot. It provides the investigation's findings and makes safety recommendations and safety observations to support local improvements in patient safety. The report also identifies safety risks that HSIB might address through a potential future national investigation.

This report is intended for healthcare organisations, policymakers and the public to help improve patient safety. For readers less familiar with this area of healthcare, medical terms are explained in section 1.

Our investigations

Our investigators and analysts have diverse experience of healthcare and other safety-critical industries and are trained in human factors and safety science. We consult widely in England and internationally to ensure that our work is informed by appropriate clinical and other relevant expertise.

We undertake patient safety investigations through two programmes:

National investigations

Concerns about patient safety in any area of NHS-funded healthcare in England can be referred to us by any person, group or organisation. We review these concerns against our investigation criteria to decide whether to conduct a national investigation. National investigation reports are published on our website and include safety recommendations for specific organisations. These organisations are requested to respond to our safety recommendations within 90 days, and we publish their responses on our website.

Maternity investigations

We investigate incidents in NHS maternity services that meet criteria set out within one of the following national maternity healthcare programmes:

- Royal College of Obstetricians and Gynaecologists' 'Each Baby Counts' report
- MBRRACE-UK 'Saving Lives, Improving Mothers' Care' report.

Incidents are referred to us by the NHS trust where the incident took place, and, where an incident meets the criteria, our investigation replaces the trust's own local investigation. Our investigation report is shared with the family and trust, and the trust is responsible for carrying out any safety recommendations made in the report.

In addition, we identify and examine recurring themes that arise from trust-level investigations in order to make safety recommendations to local and national organisations for system-level improvements in maternity services.

For full information on our national and maternity investigations please visit our [website](#).

Executive Summary

This investigation explored the following real patient safety event, looking at the local stroke emergency care pathway and the co-ordination between the Ambulance Trust and two hospital trusts involved in the event.

The safety event

The Patient, a man aged 75 years, had gone to bed at 23:30 hours and woke at 01:30 hours feeling unwell. He went downstairs and waited for his symptoms to ease. While he was waiting, his Wife woke and went to check on him. When it was clear that her husband's symptoms were not getting better, she rang NHS 111 for advice. Because of the nature of the Patient's symptoms, this resulted in the call being transferred to the 999 service. This call was made at 04:16 hours and was categorised as a Category 2 emergency response - that is, the second most urgent category.

An ambulance was allocated at 04:32 hours and arrived with the patient at 05:06 hours. The paramedics immediately recognised the symptoms of a stroke and helped the Patient into the ambulance.

Before the ambulance set off, the paramedic caring for the Patient telephoned (pre-alerted) the emergency department (ED) at Trust A, which was the nearest ED, to let them know that they were on the way with a patient who was experiencing stroke symptoms. This type of call is known as a 'pre-alert'. Trust A could not accept the Patient as its stroke service was not open between 23:00 hours and 08:00 hours. The paramedic was advised to call the ED at a neighbouring hospital, Trust B. Trust B told the paramedic that it could not accept the Patient, as he was outside the timeframe for immediate stroke treatment and should therefore be taken to Trust A. Trust A again stated that it could not accept the Patient. The paramedic contacted Trust B for a second time and it agreed to accept the Patient.

When the ambulance arrived at Trust B's ED, the Patient was held in the ambulance for 40 minutes because the ED was very busy. He then had a CT scan which confirmed that he had had an ischaemic stroke (a stroke caused by a blood clot in the brain). The Patient was taken to the intensive care unit.

The investigation found that at each trust, the ED staff had a limited understanding of the other trust's arrangements for out-of-hours stroke services. The two trusts did not have a joint arrangement for overnight emergency stroke treatment. The paramedics also found it difficult to access information about the stroke services at each hospital, and where they should take a stroke patient between 23:00 hours and 08:00 hours.

The investigation identified that there was a delay in the initial response by the ambulance service and in the handover of the Patient's care from the paramedics to the ED. These issues were outside the scope of this investigation but will be explored in a separate HSIB investigation.

Findings

The investigation found the following:

- The Patient spent time on his own after waking with stroke symptoms, hoping that his symptoms would ease. The delay in seeking help meant that the Patient was outside of the 4.5-hour treatment window for thrombolysis (treatment with 'clot-busting' medication) by the time the paramedics arrived.
- The Patient was still within the 24-hour treatment window for consideration of thrombectomy (a procedure to remove a blood clot).
- There was no cross-trust policy in place that clearly defined which FAST-positive patients (patients who show symptoms outlined by the Face, Arms, Speech,

Time acronym) should be taken to Trust B overnight. This resulted in different local interpretation of the overnight stroke arrangement.

- The different local interpretation resulted in the Patient being “double bounced” between the two hospitals. Staff stated that this was “not uncommon” but would likely resolve once a centralised regional stroke treatment unit (a hyper-acute stroke unit) is in place.
- All staff followed their own trust’s policy relating to overnight stroke arrangements when responding to the paramedic’s pre-alert call.
- Because of the high number of calls awaiting the allocation of an ambulance, the ambulance that responded to the incident was allocated from a neighbouring area.
- The responding paramedics knew where the nearest ED to the Patient was, but did not know about the services that Trust A and Trust B provided without accessing further resources.
- The electronic search tools accessible to ambulance crews provided inconsistent information about the availability of local stroke services. This was particularly confusing for the paramedics in the safety event, who did not routinely work in the local area.
- The paramedics recalled that hospital staff who took the pre-alert calls responded in a “frustrated” manner; this can in turn create frustration for ambulance crews.
- When the Patient arrived at the hospital, his care was not handed over within the recommended 15 minutes.
- An ED doctor stated that it was now “normal” to start a shift at 22:00 hours and see five or more ambulances queueing while they waited to hand over the care of patients. This situation worsened as winter approached.

Safety recommendations, safety observation and safety risk

Safety recommendations are directed to a specific organisation for action. They are based on information derived from the investigation and are made with the intention of preventing future similar events.

HSIB makes the following safety recommendations

Safety recommendation R/2022/185:

HSIB recommends that Trust A and Trust B update the information provided to the Directory of Service on the availability of stroke services once they have created a harmonised cross-trust stroke policy.

Safety recommendation R/2022/186:

HSIB recommends that the Ambulance Trust works with Trust A and Trust B to ensure that their local stroke policies are aligned and direct ambulance crews to the most appropriate service.

Safety recommendation R/2022/187:

HSIB recommends that Trust B works collaboratively with Trust A to develop a harmonised, cross-trust stroke policy with a clearly defined joint emergency department overnight stroke protocol for FAST-positive patients.

HSIB makes the following safety observations

Safety observation O/2022/154:

It may be beneficial for the clinical commissioning group to provide oversight of stroke pathways until a hyper-acute stroke unit is established, to ensure that there is a clearly understood pathway for FAST-positive patients between 23:00 hours and 08:00 hours.

HSIB notes the following national safety risk

The investigation noted a delay in the handover of the Patient's care from the paramedics to the emergency department. Handover delays will be explored in a future HSIB investigation.

1 Background and context

1.1 Stroke

1.1.1 Every year in the UK over 100,000 people are diagnosed as having a stroke. It is the fourth most common cause of death in the UK (Stroke Association, 2018).

1.1.2 Stroke is a neurovascular condition, which means it relates to the blood supply to, and blood vessels in, the brain. In a stroke, a lack of oxygenated blood causes a person's brain cells (neurons) to die. This can lead to disability or death. There are two main types of stroke:

- haemorrhagic stroke, caused by bleeding in a person's brain
- ischaemic stroke, caused by a blood clot in a person's brain.

Ischaemic stroke is the most common type, accounting for 85% of cases.

1.1.3 One in 10 people who have a stroke in the community die before reaching hospital (Stroke Association, 2018). In the case of ischaemic stroke, the clot may develop in a blood vessel that serves a very large part of the person's brain and can cause severe neurological impairment and/or death.

1.1.4 Patients who survive this initial stage to the point of admission to hospital may experience a plateau in their signs (things that clinicians find through examinations and tests) and symptoms (health issues that the patient experiences). These signs and symptoms may improve over time. Patients may need rehabilitation or have a permanent disability that means they need ongoing care and support with daily living.

Diagnosis of stroke

1.1.5 A stroke is often suspected based on a person's symptoms, particularly when the stroke occurs outside of a healthcare setting. The development of the FAST test has led to more members of the public spotting when a person may be having a stroke. This earlier identification means that the public are calling 999 sooner, and intervention can begin sooner.

1.1.6 Formal diagnosis of stroke takes place in hospital. Patients have a physical examination and a range of diagnostic tests, including blood samples, and X-ray/CT imaging. Most areas in the UK have dedicated stroke centres (acute stroke units). Increasingly, hyper-acute stroke units (HASUs) (Royal College of Physicians, 2016) are being set up to care for stroke patients in a centralised way, similar to the improvements made in the pathways of care for heart attack and trauma (serious injury) patients.

Treatment of haemorrhagic stroke

1.1.7 The treatment options for haemorrhagic stroke are limited. Some patients may undergo an operation called a craniotomy. This involves removing a section of their skull over the affected area of the brain. The aim of this treatment is to reduce the build-up of pressure in the brain which can cause further damage.

Treatment of ischaemic stroke

1.1.8 Patients who have had an ischaemic stroke can receive thrombolysis, a 'clot-busting' medicine which dissolves the clot and restores blood flow to the brain. Treatment with thrombolysis needs to begin within 4.5 hours of the onset of a patient's symptoms. After 4.5 hours the clot will become too developed and will not respond to the medication (National Institute for Health and Care Excellence, 2019).

1.1.9 For some patients who have a clot in a larger blood vessel, a procedure called a thrombectomy may be undertaken (Royal College of Physicians, 2016). This is a procedure to physically remove the clot from the blood vessel. It is done by passing a catheter (a flexible tube) into the blood vessel and advancing a small instrument towards the clot to assist its removal.

1.2 FAST

1.2.1 The NHS (2019) describes the symptoms of stroke using the acronym FAST (Face, Arms, Speech and Time):

Face – the face may have dropped on 1 side, the person may not be able to smile, or their mouth or eye may have dropped.

Arms – the person with suspected stroke may not be able to lift both arms and keep them there because of weakness or numbness in 1 arm.

Speech – their speech may be slurred or garbled, or the person may not be able to talk at all despite appearing to be awake; they may also have problems understanding what you're saying to them.

Time – it's time to dial 999 immediately if you see any of these signs or symptoms.'

Patients showing these symptoms are referred to in this report as 'fast-positive'.

1.2.2 Members of the public are encouraged to use the FAST acronym. It is also commonly used across the healthcare system as an immediate assessment tool when it is not possible for a patient to have a CT scan straight away. Emergency ambulance crews use FAST to help them decide whether to take a patient to hospital and if so, to which service.

1.3 Ambulance pre-alert

1.3.1 Emergency ambulance clinicians make a 'pre-alert' call to inform a hospital emergency department (ED) that they are on their way with a patient who needs a specific type of care. This ensures that the hospital can prepare its response before the ambulance arrives at the ED.

1.3.2 The pre-alert criteria are set out in 'UK NHS ambulance services pre-alert guideline for the deteriorating adult patient' (Royal College of Emergency Medicine and Association of Ambulance Chief Executives, 2020). They include FAST-positive patients who are within the 4.5-hour treatment window for thrombolysis.

1.4 Ambulance response categories

1.4.1 The NHS England and NHS Improvement Ambulance Response Programme (ARP) was established in 2015. Its stated intention was to increase the operational efficiency of ambulance services while maintaining a focus on the clinical needs of patients. Three objectives were identified as central to the programme (NHS England and NHS Improvement, 2018):

- prioritising the sickest patients, to ensure they receive the fastest response
- driving clinically and operationally efficient behaviours, so the patient gets the response they need first time and in a clinically appropriate timeframe
- putting an end to unacceptably long waits by ensuring that resources are distributed more equitably among all patients.

1.4.2 The ARP conducted large-scale clinical trials within English ambulance services and issued final ARP guidance in July 2017. It established new ambulance response categories and the average response times expected for each. These are:

- Category 1: For calls to people with immediately life-threatening and time-critical injuries and illnesses. These will be responded to in a mean average time of 7 minutes, with at least 90% of calls receiving a response within 15 minutes.
- Category 2: For emergency calls, such as cases of stroke or chest pain, which may require rapid assessment and/or urgent transport. These will be responded to in a mean average time of 18 minutes, with at least 90% of calls receiving a response within 40 minutes.
- Category 3: For urgent calls which require treatment and transport to an acute setting (such as a hospital emergency department). The aim is for at least 90% of calls to receive a response within 120 minutes.

- Category 4: For less urgent calls where some patients may also be given advice over the telephone or referred to another service. The aim is for at least 90% of calls to receive a response within 180 minutes.
- Category 5: For calls which require clinical assessment but not an ambulance response. The aim is for at least 90% of calls to receive a call back from a clinician within 180 minutes.

1.4.3 The symptoms of stroke would normally prompt a Category 2 ambulance response, unless the patient or caller reported other more urgent symptoms that may require a Category 1 response.

2 The safety event

2.1 At 23:30 hours on a Wednesday evening, the Patient, a man aged 75 years, went to bed feeling well. He woke 2 hours later, at 01:30 hours, with a headache and feeling unwell. He went downstairs and waited to see if his symptoms would ease, but went on to develop nausea, dizziness, and an inability to swallow.

2.2 The Patient's Wife woke sometime later and telephoned NHS 111 for advice when she saw that her Husband's symptoms were not getting any better. The time of this call is unknown. The information she provided resulted in the call being transferred to emergency 999 services at 04:16 hours. An ambulance was subsequently sent to the Patient's home at 04:32 hours, as a Category 2 emergency call.

2.3 The responding ambulance was crewed by two paramedics who were working in a neighbouring area. The paramedics were notified via their onboard radio that the Patient had stroke symptoms.

2.4 The ambulance arrived at the Patient's home at 05:06 hours. The paramedics performed a neurological examination (a means of checking the person's brain function), an electrocardiograph (a check of the Patient's heart rhythm) and checked the Patient's blood pressure, which was raised. The Patient was confirmed as Face, Arms, Speech, Time (FAST) positive and in need of urgent transfer to hospital for further assessment, to determine if he was suffering a stroke.

2.5 The paramedics helped the Patient to walk from the house to the ambulance. At approximately 05:25 hours one of the paramedics made a pre-alert call to the emergency department (ED) at the nearest hospital (Trust A), to let them know that they were bringing in a FAST-positive patient.

2.6 A doctor at Trust A's ED took the pre-alert call. The doctor told the paramedic that Trust A did not run a stroke service between 23:00 hours and 08:00 hours, and so was unable to accept the Patient. The paramedic was advised to pre-alert the ED at a neighbouring hospital (Trust B).

2.7 The paramedic telephoned Trust B's pre-alert 'red phone', which is situated within the ED, and explained to a member of staff that they were with a FAST-positive patient, and that Trust A had redirected them. The 'red phone' was passed to a senior ED doctor who determined that the patient was outside of the 4.5-hour treatment window for thrombolysis.

2.8 As with Trust A, the doctor at Trust B told the paramedic that the Trust's stroke service did not run overnight. The paramedic was advised to contact the ED at Trust A again, as this was the nearest hospital to the Patient.

2.9 The paramedic contacted Trust A's ED for a second time. The member of staff who took the call reiterated that all FAST-positive patients must be taken to Trust B between 23:00 hours and 08:00 hours. After a second pre-alert call to Trust B's ED, they agreed to accept the Patient.

2.10 The ambulance arrived at Trust B's ED at 06:03 hours. The paramedics recalled that when they arrived there were two other emergency ambulances queuing outside the ED, also with patients on board.

2.11 One of the paramedics left the ambulance and went to find the ED triage nurse, who stated that she was unaware that a pre-alert call had been made. The Patient remained in the ambulance for 40 minutes. The paramedics continued to monitor his condition until a CT scan could be organised. The scan confirmed that the Patient had had an ischaemic stroke.

2.12 After the CT scan, the Patient was moved to the intensive care unit (ICU) and a tracheostomy was performed (surgery to create an opening at the front of the Patient's windpipe so that a tube could be inserted to help him breathe). The Patient spent around 2 weeks on the ICU. He was then moved to the stroke unit, where he stayed as an inpatient for 2.5 months. Unfortunately, the Patient's condition deteriorated and he died while on the stroke unit.

3 Involvement of the Healthcare Safety Investigation Branch

This section outlines how HSIB was alerted to the safety event and the investigation process.

3.1 Notification of the safety event

3.1.1 HSIB has connected with several hospitals and ambulance services which are taking part in a pilot of local integrated investigations. The trusts were asked to refer safety events that involved cross-boundary care (for example, care across ambulance services, acute hospitals, and primary care services).

3.1.2 After the safety event described in section 2 was referred, HSIB reviewed the details using a defined process and the Chief Investigator authorised a local investigation. The investigation was launched within 5 working days of the referral, and the investigation promptly engaged with the trusts to start the investigation. The investigation did not have the opportunity to engage with the Patient or his Wife because of the COVID-19 situation at the time, the fact that the stroke unit was closed to all visitors, and the deterioration of the Patient's condition over the course of the investigation.

3.1.3 The HSIB local investigation did not replace any local trust or national processes for disclosure and investigation of patient safety events.

3.1.4 The investigation focused on the key communication points in the Patient's care pathway. This included:

- Conducting a detailed investigation of:
 - interactions between and within hospitals and ambulance crews to convey a FAST-positive patient to hospital
 - systems and processes used by each provider relating to pre-alert calls and local overnight stroke care arrangements
 - guidance, policy, and local practice in support of pre-alert calls for FAST-positive patients and the provision of stroke care and treatment.
- Gathering information from provider organisations and staff to help analyse the events.
- Seeking to understand any cultural elements around the safety event.

- Forming conclusions about the factors that contributed to the safety event, without allocating blame.

3.2 Evidence gathering

3.2.1 Evidence was gathered and reviewed by the investigation, including:

- the policies, procedures and practices of the Ambulance Trust and the hospital trusts
- the assessment of the safety event by the Ambulance Trust and the acute trusts
- national guidelines and standards
- research literature relevant to the identified safety risks
- relevant HSIB national investigation reports.

3.2.2 The investigation also interviewed staff who were involved in the safety event and observed work in practice at the trusts. Information from interviews was analysed to identify themes relating to the safety risk.

3.3 Analysis of the evidence

3.3.1 The investigation used the Systems Engineering Initiative for Patient Safety (SEIPS) (see appendix) to analyse the evidence it had gathered.

3.3.2 This method allowed a detailed analysis of the local systems of work that had an impact on the safety event. It also provided insights into potential national issues influencing the local system.

3.4 Verification of findings

3.4.1 HSIB investigations are independent; they are not undertaken on behalf of patients, families, staff, organisations or regulators. Stakeholder participation in each investigation is ensured, and draft reports are shared with the stakeholders to verify their accuracy.

3.4.2 Once all the evidence has been gathered and analysed by the investigation, safety recommendations and safety observations are drafted. Where safety recommendations are made, these are directed to specific organisations that can influence and support change. The investigation engages with relevant stakeholders before publication to agree the safety recommendations.

3.4.3 Where an HSIB investigation identifies the potential for learning outside the scope of the investigation, such as national learning in these local investigations, this is noted in the report and is taken forward by HSIB for future learning.

4 Analysis and findings

This section describes the investigation's findings in relation to the safety event.

4.1 National stroke guidelines

4.1.1 The National Institute for Health and Care Excellence (NICE) guideline NG128 (National Institute for Health and Care Excellence, 2019) gives guidance on two treatments available to patients who have suffered an ischaemic stroke: thrombolysis and thrombectomy. Both treatments are time critical. NICE recommends that thrombolysis is administered 'as soon as possible within four and a half hours of onset [of symptoms]', and that thrombectomy is offered to patients 'last known to be well between six hours and 24 hours previously' (National Institute for Health and Care Excellence, 2019). The investigation learned that thrombolysis is the most commonly administered treatment due to being the more immediate, more accessible, and less invasive option.

4.1.2 In the safety event, the Patient went to bed feeling well and woke 2 hours later, at 01:30 hours, with stroke symptoms. It is unclear whether the Patient woke because of the symptoms or for other reasons; therefore, it was not possible to determine the exact time of symptom onset. In such cases, Trust A and Trust B both work from the time a patient was 'last known to be well' when assessing a patient's eligibility to receive thrombolysis or thrombectomy. The Patient was last known to be well when he went to bed at 23:30 hours.

4.1.3 When the paramedics arrived at the Patient's home, his Wife told them that the Patient had spent some time alone after waking, hoping that his symptoms would ease. The Patient's Wife had woken up sometime later and had called NHS 111 to seek advice. The call was then escalated to the emergency services at 04:16 hours, when the information provided indicated that the Patient may be suffering a stroke.

4.1.4 The time from the Patient being 'last known well' to the time the ambulance arrived at 05:06 hours was approximately 5 hours and 30 minutes. This meant that the Patient was outside of the 4.5-hour window to receive thrombolysis. The Patient was still within the 24-hour treatment window for consideration of thrombectomy, in accordance with NICE (2019) guidance.

4.2 Ambulance allocation

4.2.1 Ambulance service staff are trained to respond to every person with a suspected stroke as a medical emergency, requiring immediate transfer to a specialist stroke unit or emergency department (ED). The quicker a patient's stroke symptoms are recognised and treated, the better their chances of survival and recovery (Royal College of Physicians, 2016). In the safety event, the paramedics responded to the Patient in line with national guidance. They used a validated screening tool (the 'FAST test') and pre-alerted hospital staff before the Patient's arrival at the ED so that stroke care could be organised.

4.2.2 The symptoms that the Patient displayed when triaged during the 999 call triggered a Category 2 response. The NHS England and NHS Improvement (2018) Ambulance Response Programme (ARP) states that all ambulance trusts should respond to Category 2 calls in 18 minutes on average and respond to 90% of Category 2 calls in 40 minutes. In this case, the ambulance arrived 48 minutes after the 999 call was made, which was outside of the 90th percentile target of 40 minutes of the call being made. The response time was a result of the high demand in the region for emergency ambulances. This investigation does not explore this issue, but it will be the subject of a future HSIB national investigation.

4.2.3 The Ambulance Trust told the investigation that on the evening of the incident, the Trust was experiencing a high volume of calls. In the hour that the 999 call was made (04:00 hours to 05:00 hours), the Trust reported that in the immediate area of both hospitals an average of 13.1 calls were waiting for an ambulance to become available to respond. In the wider region an average of 35.1 calls were waiting for ambulances to become available.

4.2.4 The Ambulance Trust also reported that there were 110 patient care handovers at Trust B over the 24-hour period of the day of the safety event. The average handover duration was 1 hour 7 minutes and the overall time lost in handovers that took longer than 15 minutes was 97 hours. This equated to approximately eight ambulances for a full 12-hour shift not available to respond to

999 calls. Trust-wide, over the same 24-hour period, the overall time lost in handovers was 608 hours, equating to approximately 51 ambulances not available for a full 12-hour shift.

4.2.5 Due to the high number of calls awaiting the allocation of an ambulance, the ambulance that responded to the safety event was allocated from a neighbouring area. While the paramedics did not normally cover the area where the Patient lived, they had done so in the past and were familiar with the location of the hospitals.

4.2.6 The paramedics knew where the Patient's nearest ED was (Trust A). However, they did not know about the services it provided without accessing further resources.

4.3 Ambulance pre-alert process

4.3.1 The paramedics informed the investigation that when deciding where to take a FAST-positive patient, they predominantly rely on their own knowledge of local services and access to Ambulance Trust policy. If they were operating outside their usual area or needed additional information, they had access to two electronic search tools on mobile devices. The investigation observed that the electronic search tools provided ambulance crews with inconsistent information about the availability of local stroke services. This was particularly confusing for ambulance crews who did not routinely work in the local area, as was the case in the safety event.

4.3.2 The most up-to-date search tool available to ambulance crews is the NHS Directory of Service. The Directory of Service is responsible for directing patients and clinicians to appropriate services (NHS Digital, n.d.).

4.3.3 On observing the Directory of Service search function, the investigation was provided with information regarding the availability of stroke services at Trust A and Trust B, including the arrangement to bypass FAST-positive patients to Trust B overnight.

4.3.4 Ambulance staff explained that the Directory of Service was rarely used in practice, as it requires a combination of search functions and is therefore too time-consuming to access when attending to a severely unwell patient.

4.3.5 The most accessible and frequently used online resources were the Ambulance Trust's policies. The paramedics were unable to recall if they accessed the Trust's stroke policy.

4.3.6 The investigation observed that the Trust's stroke policy advised ambulance crews to convey all FAST-positive patients to Trust B between 23:00 hours and 08:00 hours. This aligned with Trust A's stroke policy but not Trust B's. An ambulance crew relying on the stroke policy to direct them to the most appropriate service would not be made aware of the local arrangements in place between 23:00 hours and 08:00 hours.

HSIB makes the following safety recommendations

Safety recommendation R/2022/185:

HSIB recommends that Trust A and Trust B update the information provided to the Directory of Service on the availability of stroke services once they have created a harmonised cross-trust stroke policy.

The intention of this safety recommendation is that both Trust A and Trust B amend the Directory of Service so that ambulance crews know which services are available to them.

HSIB makes the following safety recommendations

Safety recommendation R/2022/186:

HSIB recommends that the Ambulance Trust works with Trust A and Trust B to ensure that their local stroke policies are aligned and direct ambulance crews to the most appropriate service.

The intention of this safety recommendation is that ambulance crews have access to the most up-to-date information, enabling them to make accurate and timely decisions about where to take patients with a suspected stroke.

4.3.7 The paramedics' limited knowledge of local stroke services, combined with the challenges in accessing accurate service information online, influenced their decision to pre-alert Trust A in the first instance, as they knew this was the nearest local hospital. The lack of consensus between Trust A and Trust B regarding where to transfer patients overnight who are not eligible for thrombolysis, meant that the paramedics were required to take on a co-ordinating role as well as looking after the Patient. The paramedics recalled that the staff who took the pre-alert calls responded in a "frustrated" manner, which can in turn create frustration for ambulance crew.

4.3.8 The 'UK NHS ambulance service pre-alert guideline for the deteriorating patient' (Royal College of Emergency Medicine and Association of Ambulance Chief Executives, 2020) states that pre-alert calls to the ED are only required for FAST-positive patients who are within the 4.5-hour treatment window for thrombolysis. In the safety event, the Patient was outside of this treatment window. The paramedics did not have direct access to this guideline, but the Ambulance Trust stated that it had considered it in its stroke policy. Because the Ambulance Trust works with a large number of hospital trusts, it has had to create a single stroke policy that suits every hospital trust.

4.3.9 The pre-alert guidelines available to the paramedics included the Ambulance Trust's local pre-alert policy and the Joint Royal Colleges Ambulance Liaison Committee (JRCALC) Clinical Guidelines (Association of Ambulance Chief Executives, 2019). The JRCALC guidance states that stroke response is 'TIME CRITICAL' but does not inform ambulance clinicians that there is a less than 4.5-hour treatment window for thrombolysis. It does, however, state that pre-alerts should be within a locally agreed timeframe. In line with this, the Ambulance Trust's pre-alert policy recommends that all FAST-positive patients should be pre-alerted to hospital, which was the process followed by the paramedics in the safety event. Because the JRCALC guidance, Royal College of Emergency Medicine/Association of Ambulance Chief Executives guidance, and the Ambulance Trust's pre-alert policy were not aligned, it may not have been clear to ambulance crews when to pre-alert FAST-positive patients.

4.4 ED handover

4.4.1 When the ambulance arrived at Trust B, there were two emergency ambulances already queuing outside with patients on board. One of the paramedics with the Patient went to find the triage nurse. The triage nurse's role was to assess and prioritise patients that have arrived by ambulance, some of whom will not have met the pre-alert criteria.

4.4.2 The paramedics told the investigation that the triage nurse was unaware that they had called the pre-alert phone to inform the ED that they were enroute with a FAST-positive patient. The investigation was not able to establish why the triage nurse was unaware of the pre-alert call. However, staff at Trust B thought that the pre-alert may have been cancelled because the Patient was outside the thrombolysis treatment window, and therefore did not meet Trust B's pre-alert criteria.

4.4.3 Trust B informed the investigation that the ED was “extremely busy” on the evening of the safety event. The ED had a capacity of 14 ‘majors’ beds (for patients with serious injury or illness) and six resuscitation bay beds. ED staff tried to keep two of the resuscitation beds free in case a patient in the department, or one being brought to the ED, needed resuscitation. During the hour that the Patient arrived at the ED there were:

- 3 ambulances waiting with patients on board, with the longest wait being 1 hour and 41 minutes
- 18 patients in majors and resuscitation
- 11 patients waiting for a bed/bay to be treated in. These patients were being held in ‘minors’ (the area for patients with less serious conditions) or in other areas within the department.

4.4.4 Staff at Trust B told the investigation that it had become commonplace for ambulances to queue, and that the situation was getting worse as winter approached. An ED doctor stated that it was now “normal” to start a shift at 22:00 hours and see five or more ambulances queueing.

4.4.5 As the Patient was no longer eligible for thrombolysis and the pre-alert had been cancelled, the tasks that would usually be carried out before a FAST-positive patient’s arrival at the ED were not undertaken. One of these tasks would have been to pre-arrange an immediate CT scan. In the safety event, it is not clear when the CT scan was booked, but 40 minutes elapsed between the Patient’s arrival at the ED and the CT scan being carried out. During this time, the Patient was still having difficulty with swallowing and was still suffering the effects of stroke.

4.4.6 The NHS Long Term Plan (NHS England and NHS Improvement, 2019) states that the standard time for handover of patient care from ambulance to hospital is within 15 minutes of the ambulance arriving. If the handover takes more than 30 minutes, the delay should be escalated internally within the ED. If it takes more than 60 minutes, this should trigger an investigation for the purposes of learning. The HSIB investigation did not explore the handover delay further, but this theme will be explored in a separate HSIB national investigation.

4.5 Local provision of stroke services

4.5.1 At the time of the safety event, the clinical commissioning group for the region commissioned independent stroke services at both Trust A and Trust B (see table 1). Between 08:00 hours and 23:00 hours, FAST-positive patients conveyed by ambulance were taken to their nearest local hospital (Trust A or Trust B). They would then undergo diagnostic testing and receive thrombolysis if eligible.

Table 1 Delivery of thrombolysis and thrombectomy at Trust A and Trust B

Stroke treatment		08:00 hours to 23:00 hours	23:00 hours to 08:00 hours	08:00 hours to 17:00 hours 7 days a week
Thrombolysis	Trust A	Stroke team	No service	
Thrombolysis		Stroke team	ED	
Thrombectomy				Trust B

4.5.2 Neither Trust A nor Trust B had an overnight stroke team that could deliver thrombolysis. Trust A's ED staff were unable to deliver thrombolysis overnight, but Trust B's ED team could. Therefore, all stroke patients who were eligible for thrombolysis, were taken to Trust B for that treatment.

4.5.3 All thrombectomies in the region were performed at Trust B between 08:00 hours and 20:00 hours. Eligible patients admitted to hospital (at either Trust A or Trust B) after 20:00 hours would have their thrombectomy at Trust B the following day.

4.5.4 Increasingly, many regions have seen the development of centralised hyper-acute stroke units (HASUs). This involves one trust delivering all specialised assessment and treatment to stroke patients within a region, regardless of the time of day or where the patient lives. Evidence suggests that HASUs improve patient outcomes by providing immediate access to emergency stroke care 24 hours a day, 7 days a week (Fulop et al, 2019). At the time the safety event took place, plans to develop a regional HASU located at Trust B were out for public consultation. Since that time, the clinical commissioning group for Trust A and Trust B has announced that it would be establishing a HASU at Trust B.

4.5.5 In the interim period, an overnight arrangement was in place between Trust A and Trust B to enable equal access to thrombolysis for all patients within the region. Unlike Trust A, Trust B's ED staff had undertaken the necessary training to continue to administer thrombolysis outside of the stroke team's operating hours.

4.5.6 There was no cross-trust policy or jointly agreed criteria in place that clearly defined which FAST-positive patients should be diverted to Trust B overnight. This resulted in different local interpretations of the overnight arrangement.

4.5.7 Trust A's stroke policy stated that all FAST-positive patients should be taken to Trust B's ED between 23:00 hours and 08:00 hours, and ambulance pre-alert calls were diverted to Trust B during this time. Staff at Trust B told the investigation that its ED should "ideally" only accept FAST-positive patients who are within the 4.5-hour treatment window for thrombolysis. They stated that overnight, ambulance crew should continue to take FAST-positive patients who are outside the thrombolysis treatment window to their nearest local hospital (Trust A or Trust B). Trust B staff clarified that this prevented the ED from becoming "incapacitated" by FAST-positive patients, many of whom would ultimately be diagnosed with something other than a stroke. The investigation was informed that this is not an uncommon issue because of the diverse nature of stroke symptoms, which can be similar to those of other conditions. Staff at Trust B stated that they were unaware of Trust A's local policy to divert all FAST-positive patients to Trust B overnight.

4.5.8 In the safety event, staff referred to plans to develop a HASU in the future, which they considered would resolve the disparities in local stroke service provision. The stroke services at Trust A and Trust B operated independently of each other and did not have a shared stroke policy in the interim period. Staff at Trust A and Trust B said that there was not a regular meeting between the services at which the interdependencies between them, such as overnight provision of thrombolysis, could be discussed. In the safety event, the lack of a harmonised stroke policy between Trust A and Trust B affected ED staff's clinical decision-making and caused the paramedics' confusion about where to take the Patient. The initial pre-alert call made to Trust A, at approximately 05:25 hours, was diverted to Trust B in line with Trust A's stroke protocol. On finding out that the Patient was outside the 4.5-hour treatment window for thrombolysis, Trust B's triaging doctor redirected the paramedics to the nearest local hospital (Trust A). Trust A again declined to accept the Patient based on the Trust's stroke policy, but the Patient was then accepted by Trust B on the second call to its ED.

4.5.9 When responding to the paramedics' pre-alert calls, all staff followed their own Trust's policy relating to overnight stroke arrangements. This resulted in the Patient being "double bounced" between the two hospitals. Staff at both trusts stated that this was "not uncommon" but would likely resolve once the HASU is in place.

HSIB makes the following safety recommendation

Safety recommendation R/2022/187:

HSIB recommends that Trust B works collaboratively with Trust A to develop a harmonised, cross-trust stroke policy with a clearly defined joint emergency department overnight stroke protocol for FAST-positive patients.

The intention of this safety recommendation is that Trust A and Trust B have a joint way of working, as they share responsibilities for overnight stroke services. Also, that ED protocols are amended to reflect this so that there is no ambiguity relating to the acceptance criteria for FAST-positive patients overnight.

HSIB makes the following safety observation

Safety observation O/2022/154:

It may be beneficial for the clinical commissioning group to provide oversight of stroke pathways until a hyper-acute stroke unit is established, to ensure that there is a clearly understood pathway for FAST-positive patients between 23:00 hours and 08:00 hours.

5 Summary of findings, safety recommendations, safety observation and safety risk

5.1 Summary of findings

- The Patient spent time on his own after waking with stroke symptoms, hoping that his symptoms would ease. The delay in seeking help meant that the Patient was outside of the 4.5-hour treatment window for thrombolysis (treatment with 'clot-busting' medication) by the time the paramedics arrived.
- The Patient was still within the 24-hour treatment window for consideration of thrombectomy (a procedure to remove a blood clot).
- There was no cross-trust policy in place that clearly defined which FAST-positive patients (patients who show symptoms outlined by the Face, Arms, Speech,

Time acronym) should be taken to Trust B overnight. This resulted in different local interpretation of the overnight stroke arrangement.

- The different local interpretation resulted in the Patient being “double bounced” between the two hospitals. Staff stated that this was “not uncommon” but would likely resolve once a centralised regional stroke treatment unit (a hyper-acute stroke unit) is in place.
- All staff followed their own trust’s policy relating to overnight stroke arrangements when responding to the paramedic’s pre-alert call.
- Because of the high number of calls awaiting the allocation of an ambulance, the ambulance that responded to the incident was allocated from a neighbouring area.
- The responding paramedics knew where the nearest ED to the Patient was, but did not know about the services that Trust A and Trust B provided without accessing further resources.
- The electronic search tools accessible to ambulance crews provided inconsistent information about the availability of local stroke services. This was particularly confusing for the paramedics in the safety event, who did not routinely work in the local area.
- The paramedics recalled that hospital staff who took the pre-alert calls responded in a “frustrated” manner; this can in turn create frustration for ambulance crews.
- When the Patient arrived at the hospital, his care was not handed over within the recommended 15 minutes.
- An ED doctor stated that it was now “normal” to start a shift at 22:00 hours and see five or more ambulances queueing while they waited to hand over the care of patients. This situation worsened as winter approached.

5.2 Safety recommendations and safety observations

HSIB makes the following safety recommendations

Safety recommendation R/2022/185:

HSIB recommends that Trust A and Trust B update the information provided to the Directory of Service on the availability of stroke services once they have created a harmonised cross-trust stroke policy.

Safety recommendation R/2022/186:

HSIB recommends that the Ambulance Trust works with Trust A and Trust B to ensure that their local stroke policies are aligned and direct ambulance crews to the most appropriate service.

Safety recommendation R/2022/187:

HSIB recommends that Trust B works collaboratively with Trust A to develop a harmonised, cross-trust stroke policy with a clearly defined joint emergency department overnight stroke protocol for FAST-positive patients.

HSIB makes the following safety observation

Safety observation O/2022/154:

It may be beneficial for the clinical commissioning group to provide oversight of stroke pathways until a hyper-acute stroke unit is established, to ensure that there is a clearly understood pathway for FAST-positive patients between 23:00 hours and 08:00 hours.

5.3 National safety risk

HSIB notes the following national safety risk

The investigation noted a delay in the handover of the Patient's care from the paramedics to the emergency department. Handover delays will be explored in a future HSIB investigation.

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7 Appendix

Appendix 1 The Systems Engineering Initiative for Patient Safety (SEIPS)

SEIPS was first described by Carayon et al (2006) as a framework for understanding the work systems, processes and outcomes in healthcare and the relationships between them (see figure A1). It is a systems engineering approach with human factors principles embedded within it.

Figure A1 SEIPS, adapted from Holden et al (2013)

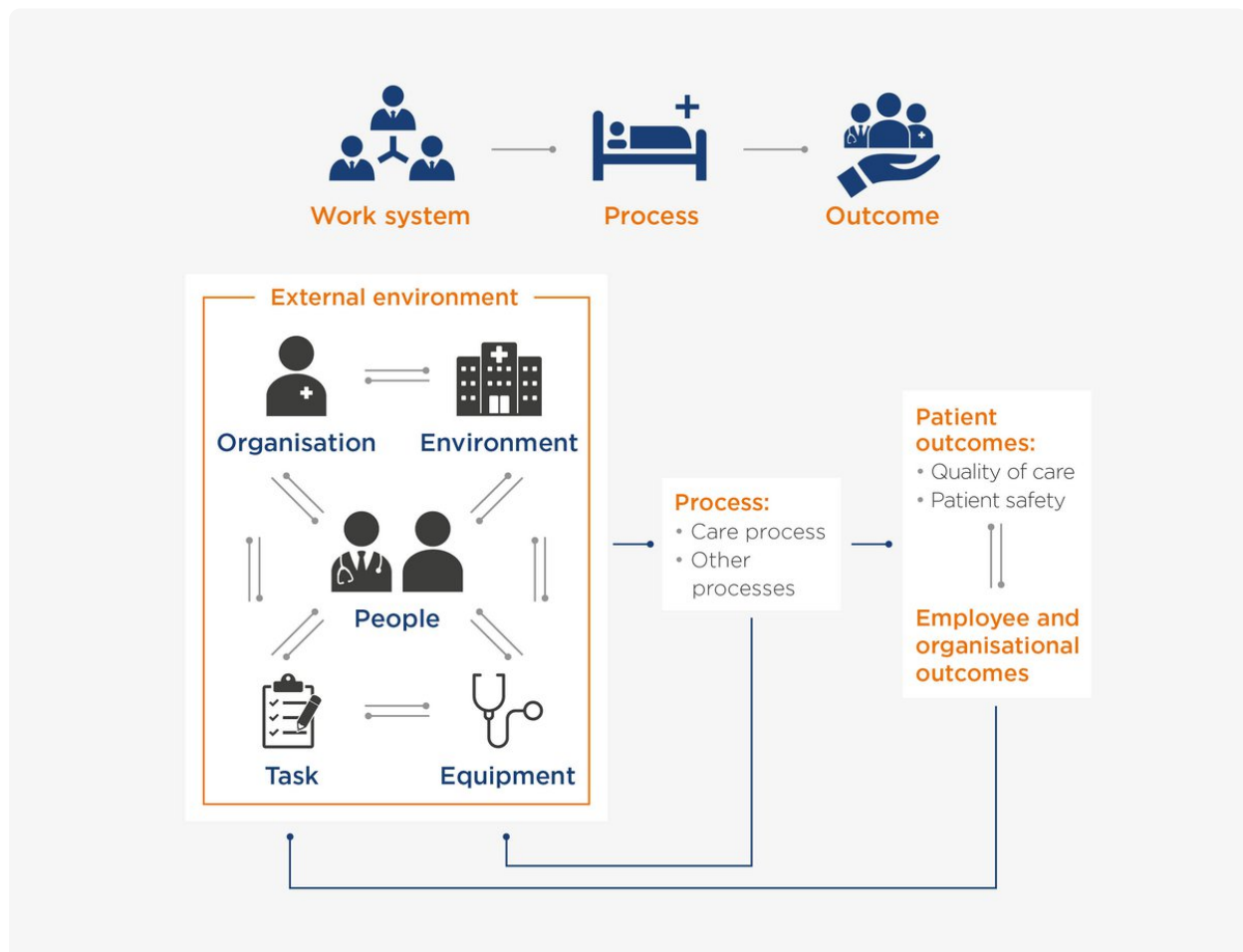


Figure A1 SEIPS, adapted from Holden et al (2013)

SEIPS describes how components of the work system produce work processes that result in different outcomes. Work system factors are described below (Holden et al, 2013; Carayon et al, 2006):

- People: the people working in the particular system and the patient.
- Tasks: undertaken by people, and which can vary in complexity or variety.
- Tools and technology: used to undertake tasks, and which can vary in usability and functionality.
- Internal environment: the physical space around people (for example, layout, noise and temperature).
- Organisation: conditions external to people to support the organisation of, for example, resources and activity.
- External environment: factors outside of the healthcare institution, such as policy, societal or economic factors.

Processes can be physical, cognitive or behavioural, and lead to outcomes for patients, professionals or healthcare institutions. Interactions between the various components of the work system lead to different outcomes, both positive and negative. The framework includes feedback loops, which represent the adjustments systems make over time.