A mixed methods study exploring inter-professional roles in the provision of UK outpatient TIA Services

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Abstract

Background: Suspected transient ischaemic attack (TIA) is a diagnostic challenge yet requires timely diagnosis for secondary stroke prevention.

Aims: To understand variability of organisational processes, roles, education, and clinical decision-making in UK TIA services.

Methods: Healthcare professionals were surveyed online in 2021 with descriptive data analysis. We conducted interviews (2021-2022) with a purposive sample. Three researchers thematically analysed interview data.

Findings: Survey responses were received from 43 TIA services. 70% conducted remote consultations, 28% face-to-face, and 2% mixed. Different physician and roles, skills and experience provided TIA services. All services involved a consultant physician with experience in stroke. Ten interviews confirmed the survey results and highlighted variability regarding: clinical decision-making; service composition; resources; learning opportunities; and mode of consultation.

Conclusion: Variability in TIA service workforce and service organisation influenced diagnostic decisions. The possible impact of such variability on clinical outcomes, and approaches to reducing it, require further research.

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Background

A cerebral transient ischaemic attack (TIA) is caused by temporary reduction in blood flow to the cerebral circulation. Ischaemic stroke and TIA have the same underlying pathophysiology, and risk of ischaemic stroke after TIA is highest in the first 24 hours (Chandratheva et al. 2009). Initiation of treatment within 24 hours of TIA onset reduces stroke risk by 80% at three months (Hackam and Spence 2007; Lavallée et al. 2007; Pan et al. 2019; Rothwell et al. 2007). Therefore, rapid assessment and treatment can prevent disability or death (Chandratheva et al. 2009).

Diagnosis of TIA is challenging because clinical features have fully resolved at assessment and no definitive test, or widely accepted diagnostic criteria, exist. Additionally, around 30-60% present with other diagnoses with similar symptoms and co-morbidities; so-called 'mimics', such as pre-syncope, anxiety and migraine (Bradley et al. 2013; Lee and Frayne 2015; Nadarajan et al. 2014; Sheehan et al. 2009; Tuna and Rothwell 2021).

Accurate recall and expert interpretation of the history are essential for diagnosis (Nadarajan et al. 2014). The COVID-19 pandemic radically changed clinical history-taking through the introduction of remote consultations by telephone or video-calls (Lim et al. 2020). The mode of consultation introduces variability in the quality and quantity of information available to the clinician. However, clinical history alone does not result in complete diagnostic certainty. Depending on the patient's clinical features, which service they present to, and local service configurations, different

professionals with different levels of expertise contribute to stages towards a final diagnosis and treatment. Professions involved include paramedics, physicians or advanced practitioners in primary care, emergency medicine, general medicine, neurology and stroke. Studies comparing TIA diagnostic agreement, either between professions or different roles within the same profession, found poor inter-rater agreement (Castle et al. 2010; Ferro et al. 1996; Kozera-Strzelińska et al. 2019; Kraaijeveld et al. 1984; Schrock et al. 2012; Smith et al. 1998; Tomasello et al. 1982). Generally, similar professional roles have the most diagnostic agreement, for example, between consultant neurologists.

In the context of diagnostic challenges, the aim of this study was to understand variability in TIA services across the UK, including service configuration; roles and responsibilities; workforce skills and training; factors influencing clinician decision-making; and the different modes of consultation.

Method

We conducted a mixed-methods study incorporating: 1) online cross-sectional survey and 2) semi-structured interviews.

Phase 1: Survey

Healthcare professionals working in NHS TIA services were invited in 2021 to complete an anonymous online survey circulated via professional specialist interest groups (British Irish Association of Stroke Physicians; the National Stroke Nursing Forum; the UK Stroke Forum Coalition; the Stroke Specific Education Framework; and through social media.

Data collection

The survey consisted of Likert scale and free-text questions (Supplementary figure 1). Likert scales rated the frequency roles and professions were responsible for triage, assessment, diagnosis, review of results and management decision-making. The survey was piloted in one TIA service.

Phase 2: Semi-structured Interviews

Participants were selected from survey respondents who expressed an interest in being interviewed. Survey results informed purposive sampling to ensure diversity in role, grade, experience, geographical area and service model. All interviewees provided verbal informed consent.

Data collection

Implementation science theory (Nilsen 2015), along with survey results, informed the interview schedule, which focused on: diagnosis of TIA, diagnostic uncertainty, differential diagnosis, decision-making and management of TIA, experiences of remote consultation practices and, training/education to deliver TIA services.

Analysis

Phase 1: We analysed survey data using descriptive statistics to provide an overview of service models and workforce. For discussion of Likert score results, we merged 'always' and 'often' categories. The original response categories are presented in figures 2 and 3.

Phase 2: Interviews were audio-recorded and transcribed using automated transcription software. All transcriptions were checked for accuracy. We a staged approach to our thematic analysis (Braun and Clarke 2006). Firstly, three researchers independently coded two interviews using open coding informed by the research aims and implementation science frameworks (Nilsen 2015). These were discussed with a fourth researcher using the constant comparative method to agree the codes and definitions (Boeije 2002). A coding framework was developed from 14 second-order codes. This was used for deductive coding of the remaining eight interview transcripts, completed independently by two researchers. Any discrepancies were discussed and resolved before co-development of the final themes by three researchers. Figure 1 illustrates the coding process leading to development of the final themes.

Ethical considerations

Ethical approval for both phases was obtained from the University Health Ethics Review Panel at the (reference: HEALTH 0165).

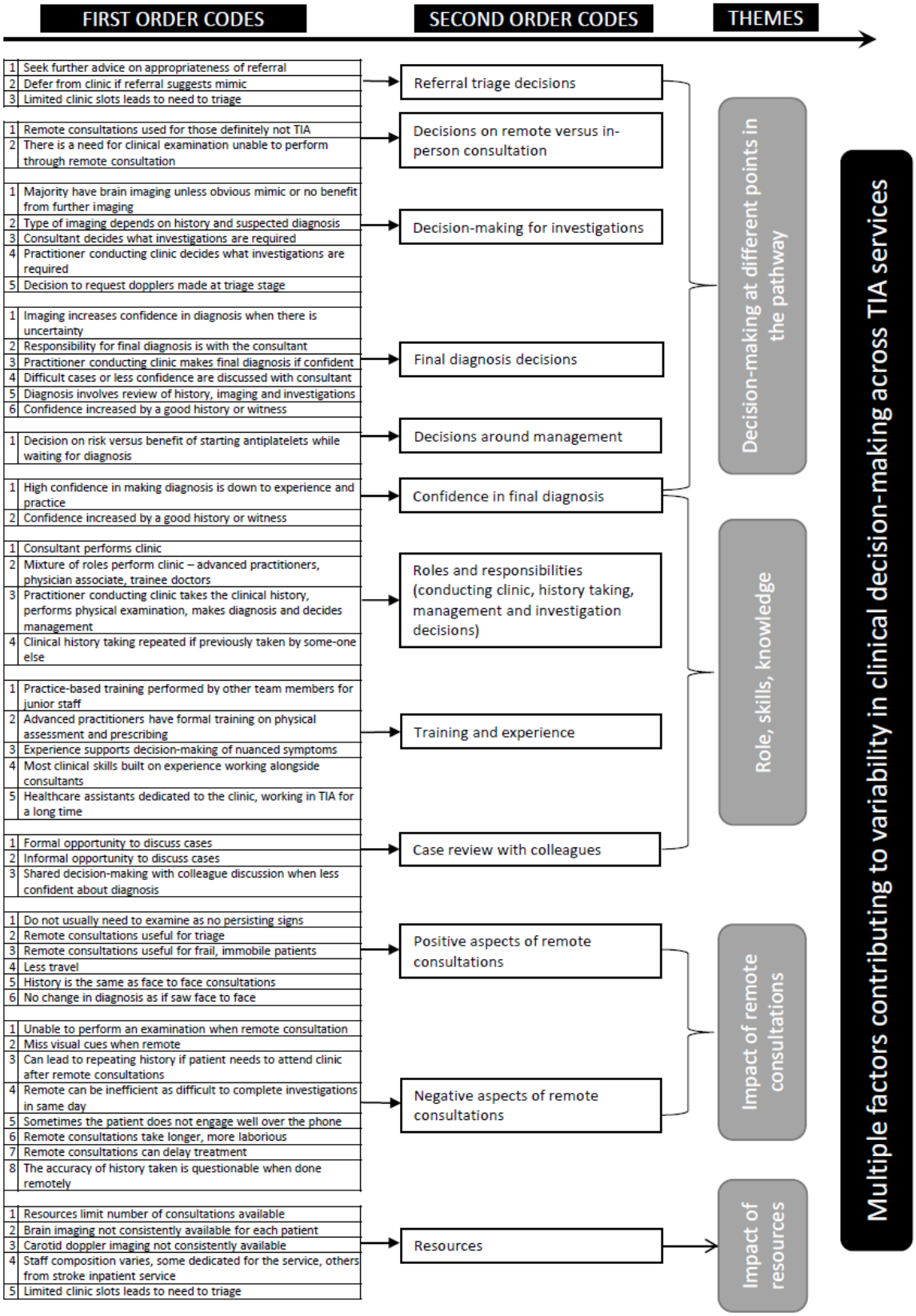

Figure 1- Coding diagram representing the coding process, with first-order codes (left), second-order codes (middle) used for coding framework and aggregate themes (right)

Results

Phase 1: survey results

The survey provided data on service configuration and roles responsible for different stages in the TIA patient pathway. The survey yielded 43 responses from 35 TIA services in England and Wales, producing a self-selecting sample of physicians and nurses. Where there were multiple respondents from one service, responses were merged and any differences between respondents were resolved by choosing the mid Likert point between the two responses.

Triage of referrals

Services used multiple methods to triage patient referrals. Thirty (86%) services used telephone consultations, n=12 (34%) used in-person assessment, and n=18 (51%) used other triage methods e.g. consultant/senior physician triage of written referral. None used video consultation for triage. Two services did not triage referrals. A Consultant Stroke Physician (n=21, 60% always or often) most performed triage. Stroke Advanced Practitioners (n=8, 23%) and Nurse Specialists (n=5, 14%) 'always' or 'often' triaged referrals.

Clinical history and physical examination at first attendance

History-taking was mainly undertaken by Consultant Stroke Physicians (CSP) (n=25, 71%) or Stroke Advanced Practitioners (SAP) (n=9, 26%)(see Figure 2).

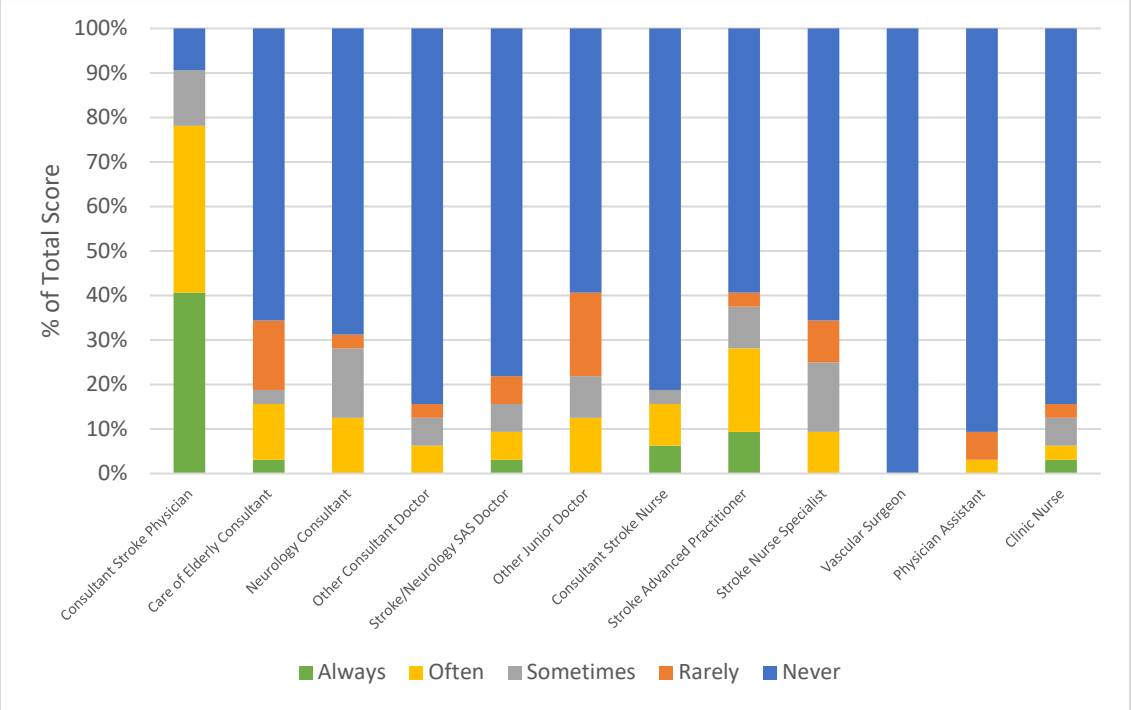

Figure 2: Frequency of roles responsible for taking clinical history at first attendance at TIA clinic

Diagnosis and management plan

Similar numbers of CSP (n=26, 74%) and SAP (n=8, 23%) determined the final diagnosis and management plan. See figure 3 for a full breakdown of roles involved.

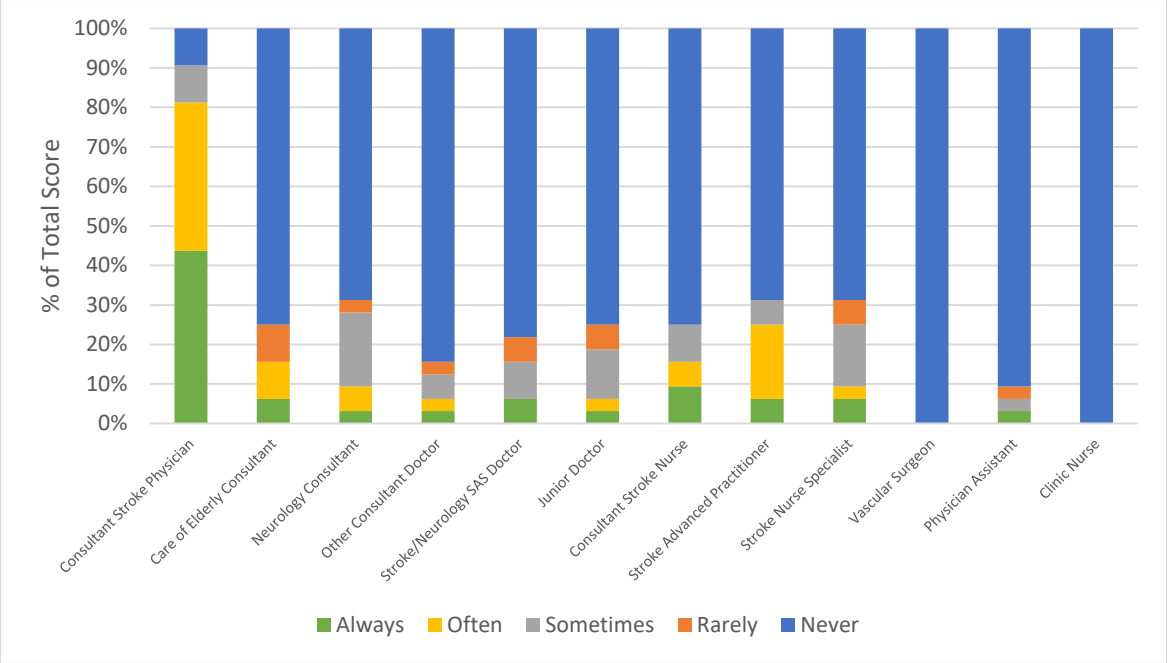

Figure 3: Frequency of roles responsible for diagnosis and management plan of TIA clinic patients

Changes to practice after the COVID-19 pandemic

Practice had changed in 17 services (49%) because of the COVID-19 pandemic and 23 (66%) reported no change (9%; no response (n=3)). The most common change was telephone consultations replacing face-to-face.

Phase 2: Interviews

The Phase 2 interviews provided detail on the clinical responsibility of different roles within a service, and on factors contributing to clinical decision-making for individual clinicians. The interviewees in Phase 2 were a self-selecting sub-set of survey respondents. Ten professionals participated in one 30-to-60-minute telephone or video call interview. The 10 interview participants were from several regions in England and different professional backgrounds (Table 1). Their experience working in TIA services ranged from 3 to 28 years (median 13; see table 1) and interviewees represented all roles delivering clinical care in TIA services.

	Role	Stroke/TIA experience (Years)
1	Consultant Stroke Physician	6
2	Community Stroke Specialist Nurse Team Manager	14
3	Advanced Nurse Practitioner	15
4	Registered Nurse	14
5	Consultant Nurse	28
6	Advanced Nurse Practitioner	15
7	Stroke Specialist Nurse	12
8	Stroke Specialist Nurse	11
9	Consultant Nurse	3
10	Stroke Specialist Nurse	10

Table 1: Interview participant roles and stroke/TIA experience

Four themes described factors contributing to variability within TIA services: (i) Decision-making at key points in the TIA pathway; (ii) Roles, skills and knowledge; (iii) Consultation processes; (iv) Resources. Figure 1 illustrates the process of coding and development of themes.

Theme 1 - Decision-making at key points in the TIA pathway

This theme comprised three sub-themes associated with different points in the pathway: triaging referrals; ; final diagnosis and management plan; and confidence in the final diagnosis.

(i) Referral triage

Participants described multiple processes for processing referrals. Some services accepted all referrals, most used symptom criteria for accepting referrals. Many described contacting patients or referrers to clarify the history **before accepting referrals**, and this could be an administrator, health care assistant, specialist nurse or consultant.

"They have a telephone consultation where the full history is taken of the event, …. and past medical history, medications, etcetera. And then a decision will be made from there if this sounds suggestive of a TIA" (Interview 4).

Extensive knowledge of TIA clinical features is important to triage referrals. For example, isolated presentation of acute dysphagia is an uncommon feature of TIA and one nurse described, *"Yesterday I had a referral - a patient with an episode lasting two to three minutes of mouth gaped open, unable to swallow. I rejected the referral and sent it back. The referrers immediately added extra information which then allowed us to offer an appointment" (Interview 5*).

Referral information was used to manage service demand;

"We have a specific referral form which has criteria to suggest this is a TIA or no, this isn't a TIA and the route people should take to try and reduce numbers of inappropriate referrals" (Interview 3).

Referral information was also used to determine consultation type and manage limited availability of investigations;

"Our stroke nurse specialists tend to call the patients, get any further information, and then we'll discuss those cases with myself or my consultant colleagues, and then we would decide what investigations are indicated" (Interview 9).

(ii) History-taking

History-taking could be conducted multiple times by different roles: on referral, during triage, at the first consultation, before or after investigations. Participants often reported taking history themselves even if a full history had previously been taken.

A 'good' history was frequently reported to influence decision-making and confidence in diagnosis. Factors contributing to a good history included high level of detail provided by the patient, symptoms well articulated and having witness accounts.

"They [witnesses] can quite often add bits that the patient misses. So, things like, oh, I noticed that their face dropped, a patient quite often won't notice. And unless they happen to look in the mirror at the time, so that makes you more confident that it was witnessed" (Interview 10).

(iii) Diagnosis and management decisions

Although participants emphasised TIA diagnosis is a clinical diagnosis, *"When you're making a diagnosis of stroke, 80 to 90 percent of your diagnosis is in the history" (Interview 3),* brain imaging was seen as important to confirm a suspected diagnosis, but also to rule out differential diagnoses. However, the availability of imaging influenced this decision in some services. Where imaging was limited, it was performed at the next available opportunity, whether this was before or after the consultation.

"I think the biggest challenge we have and I know a lot of sites are automatically doing MRI as the scan of choice, we find it more difficult to get an MRI on the day. We can do MRI within a week, but we can't necessarily get them on the day unless we really think in advance that somebody needs one and we can organise it the day before" (Interview 8).

Therefore, professionals had different information available to them at the point of diagnosis. Sometimes a diagnosis was made without imaging having been performed. In these situations, some clinicians rationalised this by reinforcing the clinical history in diagnosis.

Four participants described situations when they would not request imaging: if the patient presented with an obvious mimic; where there would be no clinical benefit of further imaging; or, not appropriate for further investigation such as nearing end-of-life. Others stressed the importance of imaging as part of the diagnostic process and ruling out other differential diagnoses.

"A differential diagnosis on this gentleman would be potentially looking at him having amyloid angiopathy because of the spreading nature of symptoms. It may be that he's having micro haemorrhages. You can't say that until you've done the MRI, and in the meantime, you've got to ensure that the patient is covered to the best of your ability to prevent stroke" (Interview 5).

Participants had increased confidence in their diagnosis when: able to conducta physical examination; 'text-book' TIA symptoms with risk factors; witnessing the symptoms themselves; and consultation with other specialities such as Ophthalmology.

"To have a conversation (with another specialist), just for that confidence that it could be vestibular vertigo, but that's not the way it works. You have to refer and then it could take a few months for an appointment. So that would give me a little bit more confidence in my decision making" (Interview 7).

Once an initial diagnosis had been made, management plans were determined on perceived stroke/TIA risk and/or risk of medications. Many chose follow-up to ascertain trajectory of symptoms, or review results of outstanding investigations that may change diagnosis or management. Although a 'one-stop' clinic was referred to, restricted on availability of investigations and certain patients requiring a watchful approach required a more open diagnosis and actions to reduce vascular risks in the interim.

Theme 2 - Variation in roles, skills and knowledge

Different professionals with different experience and training conduct TIA clinic. When not delivered by a consultant physician, the majority described consultant physician oversight. Some nurses described independent diagnostic decision-making on 'barn door' TIA cases and others described their services moving towards this approach.

"So those barn door ones. There's an accountability and responsibility and the responsibility for the ultimate diagnosis would be the consultant, although I'm trying to move towards an accountability and responsibility of a nurse specialist" (Interview 5).

Most participants, regardless of profession and training, placed importance on experiential learning. They described gaining confidence in their decision-making over time and through practice-based learning.

"I guess it's down to experience and in doing the clinic often. And I guess you get a feel for it. And if somebody had those focal neurological symptoms that have come on suddenly and left quickly, they've got those risk factors. You've almost ruled out any other possibility, I guess that's why" (Interview 10).

"I think you really can't underestimate the power of sharing clinical cases. The power of that is that you may never see another one of those again, but somebody else might. That ability to learn from others is really special. It's really good to be able to do that, because if you just learn from what you've seen that's what you've seen. But if you learn from what everyone else is seeing, you're exponentially learning" (Interview 5).

Formal TIA diagnosis training was rare, apart from core history-taking examination skills.
"I have had a physical assessment and even a masters in the prescribing. But most of the other clinical skills are being built on with experience working alongside the consultants" (Interview 10).

"I did a stroke fellowship as part of my training in geriatric medicine. I did two years of stroke medicine as a registrar. And then we get lots of talks and attend conferences" (Interview 1).

Diagnostic decision-making was at times collaborative through discussion with colleagues, although the nature of this varied between services; some had formal opportunities, for others this was informal.

"I think it is a combination. So straightforward TIAs, the nurses or the consultants would make the diagnosis. And those that we're less certain of, it would certainly involve discussion… more of a shared decision making" (Interview 10).

"We have a WhatsApp group where if we have any cases that we need to discuss, then we have the kind of communications or network with regards to that. (Interview 3).

"We have stroke, neuro, and neuroradiology MDT once a week. If you've got a tricky case and you want to talk with colleagues, that is a potential place to take it" (Interview 1).

Theme 3 – Variation in mode of consultation

Remote consultations by telephone or video call were seen as effective for specific cases including triage, cases where investigations had already been conducted, or frail, immobile patients.

"Elderly patients that were in nursing homes, that you probably wouldn't necessarily do a carotid doppler on because they wouldn't be fit for carotid surgery. And who would find the whole process of coming to clinic really difficult, actually did really well with phone and video appointments. I think for them it was actually a very positive thing" (Interview 2).

Most reported their diagnostic decision-making was not affected by the mode of consultation, citing that resolution of TIA symptoms before the consultation did not necessitate a physical examination.

However, some acknowledged remote consultations add complexity and reduce confidence in diagnosis decisions.

"I can think of one patient who we weren't confident about the diagnosis. And it was misdiagnosed because of a virtual appointment. I don't think it would have been had we seen the patient face-to-face. It was an elderly gentleman, who was referred to us with a weakness on his left side, no history of falls or anything else, it appeared to be a classic presentation of a TIA. He had his phone assessment, diagnosed with a TIA, prescribed the right medication and booked for a six-week review. The consultant requested a CT scan as an outpatient just to confirm. His scan showed a subdural hematoma. He'd had a fall, but hadn't told anyone and actually had deteriorating weakness, again, that he hadn't described over the phone. And I think had we seen that gentleman, it would have been easier to get that information from him. And I think that contributed to the misdiagnosis" (Interview 2).

Additionally, the value of remote consultations was questioned when urgent brain imaging or carotid ultrasound necessitated hospital attendance.

Theme 4 – Variation in available resources

The final theme contributing to variability is resources, including the available workforce, clinic location (remote/in-person), number of clinic slots and availability of investigations at the time of assessment. This theme over-laps with previous themes. A lack of appointments and brain/carotid imaging required triage of patients at referral (see theme 1). Some services without sufficient imaging for all TIA clinic appointments, booked patients into investigations at triage before a full clinical history had been obtained. Outstanding results at the point of diagnosis led to variability of diagnosis and management of stroke risk factors between patients within the same clinic.

"We try and get everybody to have an MRI scan, if that's what the consultant wants. Carotid dopplers are an ongoing issue with us. We would like to have two slots every day, but they won't give us that" (Interview 6).

Due to the diagnostic challenge of TIA, availability of brain imaging at the point of diagnosis increased clinician confidence.

"I think having a scan massively increases your confidence generally because you get a lot of surprises in TIA clinic and I can think of numerous surprises" (Interview 1).

Discussion

This mixed methods study aimed to explore variability in TIA services in the UK. The results demonstrate that TIA services are broadly consultant stroke physician delivered, with a growing role for advanced and specialist practitioners, usually nursing, performing triage, diagnosis and follow-up.

Although we have presented the interview data as discrete themes, these are inter-related and applicable regardless of the profession and experience of the person delivering the service (Figure 4) There was agreement that a TIA diagnosis is a clinical diagnosis based on the quality of history taking, however, several factors added variability to this process, such as the mode of consultation (in-person or remote), availability of investigations at the point of diagnosis, the knowledge and skills of the professional, and availability of case discussion with colleagues. There was agreement that experiential learning is important in this setting, both personal experience and learning from others, especially for atypical clinical features and more complex cases. In some services, this was not formalised and was reliant on the individual seeking advice.

TIA is a vascular emergency and careful consideration of the clinical history can help establish a diagnosis (Nadarajan et al. 2014). However, due to the high risk of recurrent stroke in the hours after a TIA, this requires an accurate and rapid diagnosis to avoid patient harm (Hackam and Spence 2007; Pan et al. 2019). Our study highlighted systems instigated by teams, such as referral forms with 'tick boxes' for typical TIA clinical features, were ultimately to manage finite numbers of consultation slots and brain and carotid imaging. This reflects services managing under-estimated TIA service provision for population projections (Giles and Rothwell 2007). These systems, and sometimes the individual implementing these systems, did not take into consideration the diagnostic complexity in TIA cases and were a barrier to rapid, specialist assessment. The recent introduction of remote consultations has benefits, such as improved accessibility for frail patients who struggle to attend outpatient appointments. However, our research also highlights the challenges for clinicians of diagnosing patients without an in-person assessment and detailed neurological examination (Lim et al. 2020).

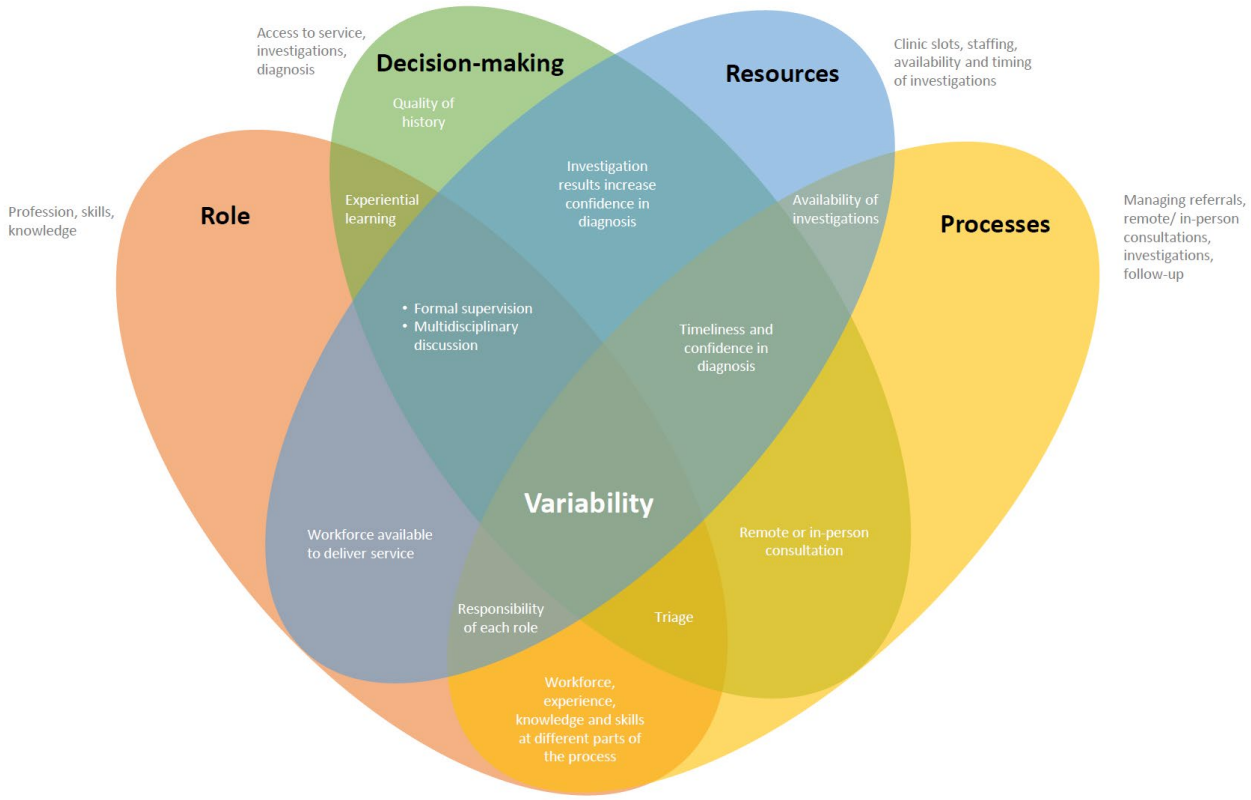

Figure 4: Diagram of themes contributing to variability in Transient Ischaemic Attack services in England and Wales

Through this exploratory research, we have highlighted that current organisation of TIA services and the roles working within them, may not been developed fully acknowledging the intrinsic complexity and uncertainty that comes with diagnosing TIA. Wherever possible, professions need to use up-to-date evidence, risk assessment tools, available technology (such as artificial intelligence reporting of brain imaging) to improve diagnostic decision-making (Intercollegiate Stroke Working Party 2022). Our research has highlighted that availability of investigations at the point of diagnosis, and formalised education and training with regular opportunities for continuing professional development need improving to support diagnostic decision-making.

Although TIA services continue to be consultant physician led, our research describes an increasing role for advanced and specialist practitioners (predominately nursing). There was agreement between professions that TIA is particularly challenging to diagnose. Diagnostic variability is well known in TIA diagnosis between physicians (Castle et al. 2010; Kraaijeveld et al. 1984; Tomasello et al. 1982). To our knowledge, TIA diagnostic variability between different professions has not been researched. Our research has identified significant variability within TIA services impacting on diagnostic decision-making. Diagnostic variability and uncertainty are known to contribute to diagnostic errors (Alam et al. 2017). . Evidence from other specialities has identified that diagnostic uncertainty can be supported through multiple strategies such as shared decision-making, resisting premature diagnosis, creating safety nets with patients, and engaging in worst/base case scenarios (Alam et al. 2017; Meyer et al. 2021; Rogers and Todd 2002; Sherrie H. Kaplan et al. 1996). This research focusses on physicians and further research is needed around multi-professional diagnosis of conditions, including TIA. Finally, organising TIA services appropriately and giving clinicians the skills that manage diagnostic complexity and uncertainty is paramount.

Limitations

As far as we are aware, this is the first study to explore national TIA service provision and the potential impact of remote consultations rapidly introduced during the COVID-19 pandemic. Generalisability of our findings is limited by selection bias introduced through our research methods. The survey was distributed through specialist-interest networks and the interviewees were self-selected from survey respondents that may not fully represent clinician experiences across the UK. Secondly, transferability of results is limited because the survey only gained data from 35 (19%) out of the reported 183 TIA services in the UK (Intercollegiate Stroke Working Party 2022; Public Health Scotland 2023). The small number of interviews also limits transferability of the results. However, using two different data collection methods leading to the same results gives more confidence in the credibility of our findings.

Conclusions

Our research on TIA services in England and Wales has demonstrated inter-related factors contributing to variability in services, staffing composition, staff responsibilities and clinical decision-making. There is a growing role for advanced and specialist practitioners in assessment and diagnosis of TIA. Further interprofessional research is required around managing diagnostic complexity and uncertainty in patients with TIA. There is a need for consensus across professional bodies on the education, skills, experience and continuing professional development for clinicians delivering TIA services.

Keywords

Transient Ischaemic Attack; clinical decision-making; differential diagnosis; service organisation; interprofessional roles

Key points

- TIA is a diagnostic challenge because symptoms have usually resolved at the time of assessment and there is no definitive diagnostic test.
- In response to stroke specialist workforce shortages and COVID-19, different service models and workforce are involved in delivering TIA services.
- We surveyed TIA services in England and Wales and interviewed physicians and nurses with different roles and experience to understand variability between TIA services.
- Four themes contributed to variability: (i) Decision-making at key points in the TIA pathway; (ii) Roles, skills and knowledge; (iii) Consultation processes; (iv) Diagnostic resources.
- We found a growing role for specialist and advanced nursing and remote consultations used for assessment and diagnosis of TIA.
- We recommend national consensus across professional bodies on the knowledge and skills required to deliver TIA services and formal evaluation of mode of consultation on the diagnostic process.

Reflective Questions

- Outline the key steps in the TIA pathway from symptom onset to diagnosis
- Why do TIA services need to be an urgent care service available 7 days a week?
- Can you identify the main causes of variability in TIA services and the potential impact on patient care?
- After reading this research, what do you think of using remote consultations in TIA services? Do you think this mode of consultation should continue to be used for diagnosing TIA?

Tables and Figures

Table 1: Interview participant roles and stroke/TIA experience

Figure captions (as a list)

Figure 1 - Diagram illustrating coding and development of themes

Figure 2: Role responsible for taking clinical history at first attendance at TIA clinic

Figure 3: Role responsible for diagnosis and management plan of TIA clinic patients

Figure 4: Diagram of themes contributing to variability in Transient Ischaemic Attack services in England and Wales

Supplementary figures

Questionnaire Survey

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