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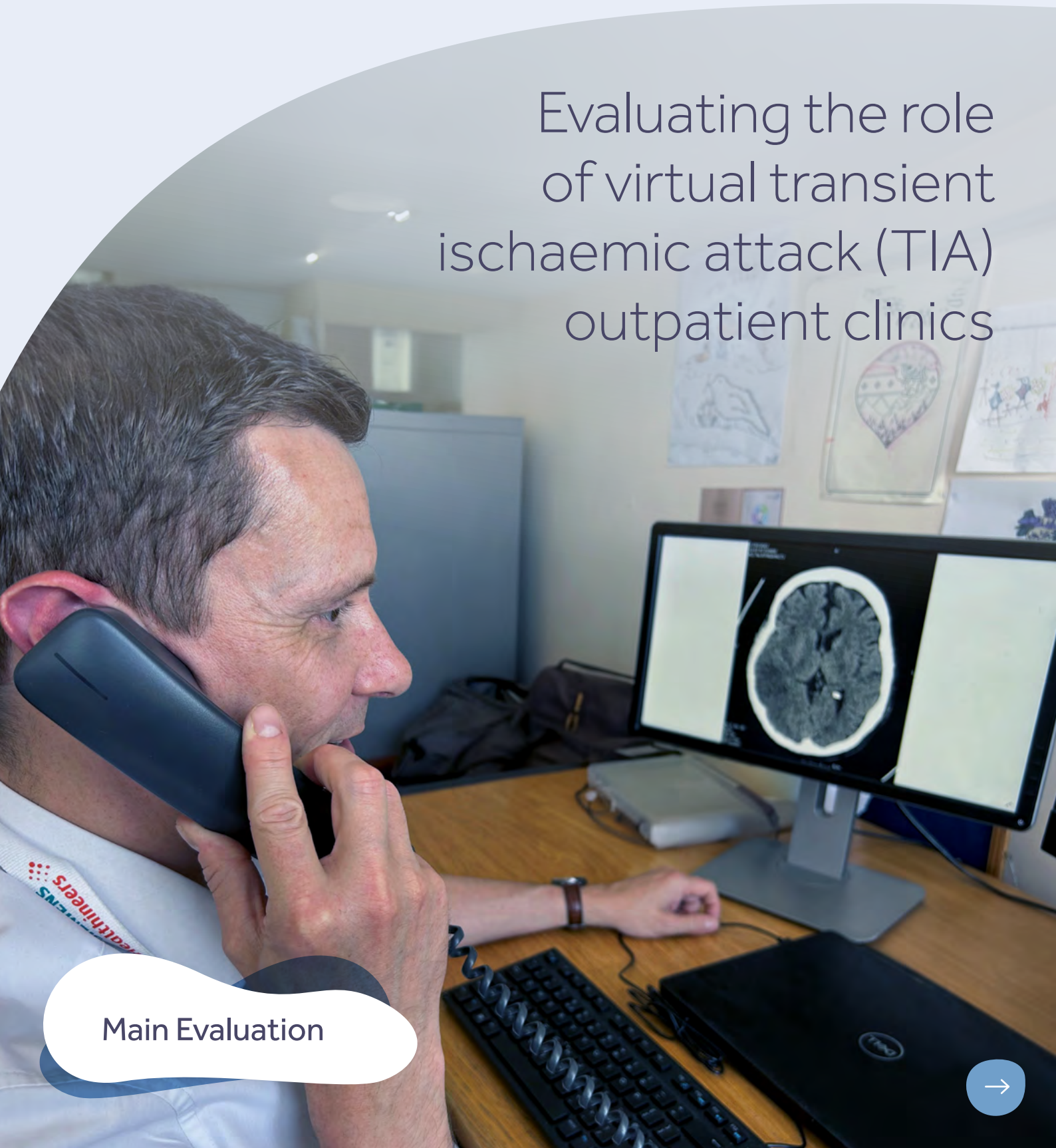
Evaluating the role of virtual transient ischaemic attack (TIA) outpatient clinics



Main Evaluation

Evaluating the role of virtual transient ischaemic attack (TIA) outpatient clinics

Contents

From 1st October 2023 the AHSN Network was renamed the Health Innovation Network with Oxford AHSN now known as Health Innovation Oxford and Thames Valley

1 Executive summary

The NHS Insights Prioritisation Programme (NIPP) was a joint initiative between the NHS Accelerated Access Collaborative (AAC) and the National Institute for Health and Care Research (NIHR). The programme invited Academic Health Science Networks (AHSNs)* and Applied Research Collaborations (ARCs) to jointly bid for a share of £4.2m investment, to evaluate promising innovations to support post-pandemic ways of working and accelerate their implementation. Oxford AHSN and ARC Oxford and Thames Valley (OxTV) were successful in securing funding to evaluate the role of virtual transient ischaemic attack (TIA) outpatient clinics.

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Virtual clinics for managing TIA were introduced during the COVID-19 pandemic in most NHS Trusts. Guidance on virtual TIA clinics was developed by Oxford AHSN and Getting It Right First Time (GIRFT) [(Appendix 1)] Some services have continued this model; others returned to face-to-face clinics or offer a hybrid approach. The effectiveness, efficiency and patient and staff experience in a virtual clinic model are unclear.

We compared face-to-face and virtual clinics by completing a real-world evaluation with qualitative interviews:

- Mapping the different care pathways in 14 clinics (12 NHS Trusts) across the South East region.
- Interviewing 15 patients and 12 healthcare professionals to gather their views and explore variation in experiences.
- Estimating the resource implications and costs of the different pathways.
- Exploring the environmental impact of virtual versus face-to-face consultations.

We found there were wide variations across both face to face and virtual services, with service models designed around local contexts and clinician preferences. There was limited consistency even where services used the same model. We developed and used the following definitions throughout this project:

- **Face-to-face model** - most patients are seen in person for their TIA clinic appointments.
- **Virtual model** - most patients' appointments and consultations are completed remotely.
- **Hybrid model** - a blended approach of the above, dependent on patient and service need.

Key findings:

1. Unwarranted variation within and between TIA clinics (even when using the same model), for referral, triage, imaging use, clinical assessment sequencing, diagnosis discussion and treatment plan. Pathways are dependent on imaging availability. Triaging of referrals is a key area for development and implementation to help manage the unpredictable demand through streamlining.
2. Virtual TIA clinics work well for some patients (e.g. frail elderly and other groups who may not require imaging, older patients with co-morbidities and/or poor mobility, young working people, carers or those living in rural areas), but not all. Being seen by a healthcare professional was very important for some patients and supported emotional wellbeing. Inconvenience of travel/ care arrangements were seen as acceptable trade-offs to be seen face-to-face.
3. Virtual consultations meant TIA patients spent less time travelling and particularly helped when patients were reliant on public transport. Also virtual clinics were a good alternative if the patient had or was supporting someone with mobility or care needs.
4. Virtual clinics were perceived to be better suited to certain parts of the pathway (e.g. triage or follow-up) or where avoiding travel was a priority. Benefits to clinicians included flexibility, time efficiency and improved time management.
5. Most virtual clinics use telephone consultations. Patients or clinicians did not favour video due to set up barriers and concerns around equity of access.
6. The mean cost of the three models were similar to each other (Virtual: mean £665 (standard deviation 318), face-to-face: mean £614 (standard deviation 227), hybrid: mean £607 (standard deviation 31)). Most of the cost is driven by the cost of imaging (MRI).
7. Both virtual and hybrid models had statistically significantly lower total mean durations (157 minutes and 160 minutes respectively) than the face-to-face model (174 minutes). However, differences observed in the number of investigations between the three models (e.g. virtual had a potentially lower number of investigations) were more likely due to differences between clinicians and access to investigations between hospitals rather than the model of care per se as no statistical matching was performed.

Main recommendations:

1. Develop a framework for the design of TIA services using the different models, with defined minimum standards; using patient and staff experiences to inform the framework, along with relevant guidance and reports. [2, 3, 4, 5] Key is the development and adoption of an improved referral system, enabling clinicians to decide which

type of patients would be best for virtual care, taking into consideration wider system factors, the preferences of patients/carers and their potential diagnosis.

2. Linked with the above, ICSs (Integrated Care Systems) should consider the commissioning of local adjunct services (e.g. First seizure, other neurological and Syncope assessment) and the impact of this on the number of referrals to the TIA service if not available. Systems should be in place to enable these services to interface with each other, so there is no need to go back to the referrer to enable transfer of the referral to another service.
3. The variation in access to imaging (particularly MRI), which limits clinic capacity and clinician decision making, should be reviewed by services, ISDNs (Integrated Stroke Delivery Networks) and ICSs working together. The role of community diagnostic centres in providing urgent imaging access should be considered as part of this review.
4. The hybrid model may offer the greatest potential benefits to patients and clinicians, in terms of experience, operational efficiency and environmental impact, if services adopt the best aspects of virtual and face-to-face models.
5. There needs to be better signposting and patient-facing information to inform patients so they understand how care will be delivered, particularly for hybrid and virtual models.
6. Patients identified after investigation to have a confirmed diagnosis of TIA may benefit from a face-to-face appointment to support their emotional wellbeing and provide timely access to secondary prevention.
7. Routine data needs to be collected by services to enable service development in line with recommendations in the GIRFT (Getting It Right First Time) Stroke programme national speciality report. [3] This could be through the TIA dataset (currently optional) within the clinical audit section of SSNAP (Sentinel Stroke National Audit Programme. Services should collect patient and staff views of their TIA service, combining this with routine data capture for ongoing monitoring and evaluation at both trust and ISDN level.
8. Specific training in communication skills for virtual care is needed for clinicians (in particular junior staff), establishing a rapport or breaking bad news may be challenging for example. Current training focuses on face-to-face setting where non-verbal communication supports interactions.
9. Building on the key findings and recommendations, this project has identified a number of areas for further research and evaluation which are summarised in section 6.2b. Some of these can and should be completed by TIA services and ISDNs, with support from organisations such as HINs, ARCs and NIHR funding support where needed.

2 Rationale for project

The pivot towards 'digital healthcare' has been substantial, particularly in the aftermath of the COVID-19 pandemic. With the rise of virtual TIA outpatient clinics during the pandemic, many questions arose regarding their efficacy, efficiency, and overall experience for both patients and staff. What drove this project was an urgent need to critically examine these new clinics, comparing them to their traditional counterparts, and to understand the intricacies and difficulties of digital healthcare. This section delves into the background, existing research, and the aspirations that framed our journey, offering a comprehensive insight into the rationale for this project.

2.1 Background information

The NHS Insights Prioritisation Programme (NIPP) began in 2021 to evaluate promising innovations to enhance post-pandemic practices, particularly focusing on remote consultations, monitoring, service delivery adjustments, and workforce concerns. The Oxford AHSN, in collaboration with NIHR ARC OxTV, secured funding to assess virtual transient ischaemic attack (TIA) outpatient clinics. These virtual clinics allow the majority of the patient journey to be done remotely, except for essential tests. Concerns exist about potential health inequalities as digital solutions might not be accessible to all.

2.2 Literature review

TIA clinics

Before the pandemic, telemedicine for TIA and stroke was scarcely practiced in the UK. With the onset of COVID-19, rapid changes were necessary, prompting an adaptation of stroke services. Several studies were published post-COVID onset, primarily focusing on the impact of the pandemic on TIA clinics [6, 7, 8, 9]. Most findings indicated that telemedicine became more common during the pandemic, with clinical outcomes remaining largely consistent. However, literature detailing the patient and clinician experience with these virtual TIA clinics remains scarce. Additionally, remote consultations have nuances and challenges, and clinicians need specific skills for effective communication in this format. [10, 11]

Health Inequalities

The search focussed on issues of inequality facing people with TIA as defined by the Equality Act 2010 and other vulnerable groups.

Some groups are at higher risk of having a TIA including older people (>55+), transgender people undergoing reassignment on gender-affirming hormone therapy,

Black and Asian people, people who are pregnant, the LGBTQ community [25, 26, 27, 28] and women, who are less likely to receive a diagnosis of a minor ischaemic stroke. [29]

In addition, some groups experience inequalities in accessing healthcare. For example, people on low incomes are less likely to have their stroke/TIA recognised by health professionals. [30]

Environmental sustainability

There is significant impetus to address the impacts of climate change on health and the contribution of health systems to climate change. [12, 13, 14] In 2020, NHS England became the world's first health service to commit to net zero. [15] Identifying a decarbonisation pathway for a complex system like the NHS is challenging. Significant carbon emissions arise from patient, visitor and staff travel, making up around 14% of the NHS's carbon footprint. Virtual consulting has been signalled as one way in which a reduction in patient and staff travel, and therefore emissions, can be achieved.

Conclusion

The results of this report and subsequent recommendations will be a very important addition to the limited literature and evidence around implementing telemedicine services in UK TIA clinics. This is particularly important if clinics are planning to continue to use telemedicine. Bagot et al [16] noted that UK specialists were particularly concerned about governance procedures, clinical pathways and required resources for implementing telemedicine consultations in stroke. This does not yet exist in UK stroke guidance and will need to be addressed in future clinical guidelines.

3 Project Design & Delivery

3.1 Project design, aims and objectives

This project was a collaborative effort between the Oxford AHSN, NIHR ARC OxTV, and the Nuffield Department of Primary Care Health Sciences (University of Oxford), alongside working with GIRFT stroke clinical lead and two PPI members with lived experience of TIA.

The overall aim of the project was to generate rapid insights (within an 18-month timeframe) to guide service design, improvement and planning for TIA outpatient clinics. The primary intended users of the evaluation are healthcare professionals working within TIA services across the five ISDNs in the South East, with a view to the findings and recommendations also being shared nationally. This report will also be of interest to those who commission TIA services, such as ICSs.

Specifically, this included whether virtual clinics should continue, the benefits and disadvantages to patients and healthcare professionals of each of the three models (face-to-face, virtual and hybrid) and considerations in relation to resource use, costs and environmental sustainability of the different models.

The objectives were:

1) Describe what a good pathway looks like for face-to-face, virtual and hybrid TIA outpatient clinics and which patients are best suited for each model.
2) Determine the current availability of data on TIA services and work with partners to identify improvements to enhance quality monitoring of services.
3) Describe the views and experiences of patients and healthcare professionals for the different models of TIA outpatient clinics.

During the project's inception, a workshop was conducted. Here, health care professionals helped develop the three main workstreams that would guide the evaluation. Alongside these workstreams, an Equality and Health Inequalities Impact Assessment was completed to assess and account for potential health disparities that might result from changes to TIA services.

One challenge encountered was the limitation in available datasets on TIA services. This limited data availability, both from a local and national perspective, meant we could not progress some aspects of the project.

Lastly, a clear governance framework was established. This framework, involving various participating organisations, ensured that the project maintained its focus, objectives, and remained accountable to its stakeholders.

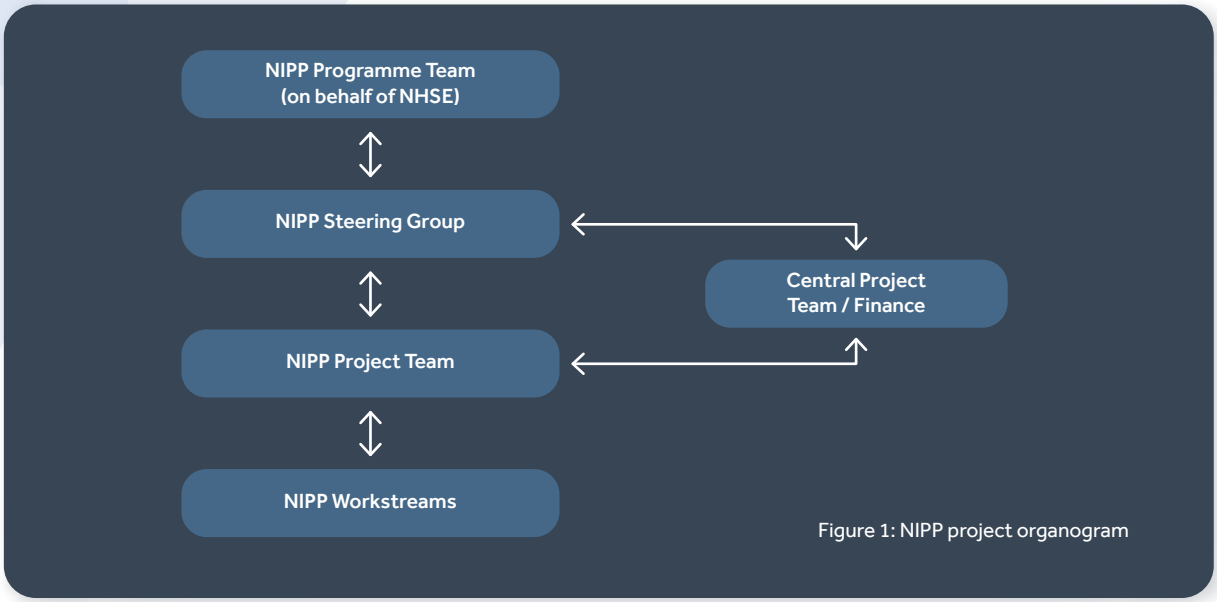

Figure 1: NIPP project organogram

3.2 Project team

For a list of evaluation team members see appendix 10.

4 Methodology

In exploring the world of virtual TIA outpatient clinics, we wanted to get a clear and complete picture. So, we used several methods to gather as much information as we could. We prioritised listening to patients/ carers making sure their experiences were front and centre. Through pathway mapping, we drew out the steps patients take in their care journey. We also had separate areas of focus, from collecting views and experiences to looking at how environmentally sustainable the services are and how resources are used. Our goal was to give a deep and well-rounded look into TIA outpatient services, especially given how healthcare is evolving these days.

4.1 Patient and public involvement

In this evaluation, the voices of patients/ carers took centre stage. Recognising a gap in literature on virtual TIA outpatient clinics, we engaged two public partners with lived experience of TIA. They were recruited via an open method, with adverts placed on social media and shared among PPI networks. These partners played crucial roles, from project and steering group activities to aiding in developing topic guides for interviews. They also worked to summarise and give context to our findings for the wider public, ensuring broader accessibility.

4.2 Pathway mapping

In pathway mapping a visual and narrative presentation of all the activities that occur in a process is produced. [17] The full pathway shows who is responsible for each activity or step and how these steps connect to reach a certain point.

We visually presented the patient pathway through the different models of TIA outpatient clinics, accounting for post-Covid-19 adjustments. Out of 26 TIA services contacted, 14 participated in this pathway mapping via Microsoft Teams meetings. Our discussions revolved around real-time TIA patient pathways, not idealistic ones, with a focus on accuracy and understanding. Post-discussion, draft maps were prepared, reviewed by the clinical teams and finalised. Areas of commonality and individuality were identified and how the different pathways compared to current guideline recommendations. The variability between all clinics, between clinics using the same model, and the lack of participating clinics meant that it was not possible to produce a single exemplar good practice map for each model.

4.3 Views workstream

In our "Views" workstream, interviews were key. Two tailored topic guides were developed: one for patients and one for healthcare professionals. These guides outline key issues and areas of questioning to guide the conversation during interviews.

We reached out to TIA services in the 5 ISDNs within the South East region and six trusts agreed to help identify potential patient interviewees. We took a 'purposive sampling approach' – deliberately selecting individuals based on their unique experiences and backgrounds, rather than selecting them randomly – ensuring diverse representation. Obtaining ethical approval was time consuming and delayed, such that our sample was much smaller than intended and we did not reach data saturation.

Healthcare professionals were also interviewed to understand their views and experiences of delivering care using the different models. All interviews were conducted over the phone or Microsoft Teams, lasting around 30-45 minutes. Using thematic analysis, insights were gleaned from these interviews. [18, 19]

4.4 Environmental sustainability workstream

To understand the environmental impact of virtual vs. face-to-face TIA consultations, we combined literature review findings [20], which included the carbon impact of virtual consultations generally, with qualitative interview data from the Views workstream.

4.5 Use of resources workstream

Lastly, in our "Use of Resources" workstream, we developed a questionnaire that captured TIA clinic activities, professionals involved, and estimated activity durations. From this, hypothetical patient journeys were created using information collected during pathway mapping and analysed for cost and duration, using available cost data [21, 22] and making certain assumptions to fill data gaps.

5 Results and discussion

5.1 Pathway mapping workstream

Summary

- There was a good representation of TIA clinics participating in the evaluation across the South East. The evaluation would have benefited from additional services participating who use a virtual or hybrid model.
- Process maps (pathways) varied significantly between all clinics and between clinics using the same model, this meant it wasn't possible to define a 'good' pathway for each model. However, example maps have been provided, to enable services to see where there may be differences and opportunities for improvement compared to the approach they use.
- Most services triaged patients, however, some services did this more in-depth which enabled efficiencies to be made, such as completion of all investigations and access to results, prior to the patient's TIA outpatient appointment. The quality of referrals was seen to impact on the ability of clinicians to effectively triage patients.
- All clinics recognised the role of virtual consultations under certain circumstances, particularly for follow-up appointments. The services using a virtual model all the time, provided a 7-day consultant-led service and saw a higher number of patients per day. Effective triaging enabled access to MRI, within the capacity for the service.
- Pathways and working practices in TIA clinics were driven primarily by imaging availability, especially MRI. Other factors were sufficient staffing and availability of outpatient clinic space.
- Approximately 50% of clinics met the NICE guideline [2] recommending MRI/MRA imaging as the first line of imaging.
- Despite NICE recommendations [2], CT scans and carotid imaging use remained high. This high usage may reflect the unlimited availability of these options compared to MRI/MRA imaging.
- The hybrid model offers the most significant potential to meet patient and clinician preferences and provide operational efficiencies.

Of the 26 TIA services contacted, 14 participated in the project (detail in table 1).

Table 1: Number of services using each model by ISDN

Clinic model	ISDN	Frimley & Surrey Heartlands	Wessex & Dorset	Kent & Medway	Sussex	Buckinghamshire, Oxfordshire & Berkshire West
	Virtual			1		1
	Hybrid		1		1	1
	Face to face	2	3	1	2	1

Twenty-nine TIA clinic staff attended meetings with the evaluation team; between one and four staff attended for each clinic. Of the 29 staff attending, 18 (62%) were stroke consultants or neurologists representing 12 clinics. For four meetings there was only one staff member present, which was a consultant for three out of the four meetings. The roles of other staff members attending the meetings included stroke specialist nurses, stroke nurse consultants, and TIA clinic administrators. Nine out of 14 clinics provided feedback on the draft maps.

Using the definitions in section 1, two TIA outpatient clinics were classified as virtual, nine as face-to-face, and three as a hybrid. It would need to be determined if this ratio would be found in a larger sample. There was a sufficient number of face-to-face clinics participating, as in later meetings, there was no new information gained on the pathway beyond individual clinic characteristics. Characteristics of all included clinics are shown in Table 2. Clinics using the face-to-face model described the face-to-face patient pathway as routine and any virtual pathway as unusual, less frequent, or rare. Any pathway for patients seen virtually in this model tended to be ad hoc. The hybrid model of TIA clinics had a defined pathway for face-to-face and virtual patients, though the percentage of patients seen face-to-face could range from 30 – 70%. Hybrid clinics appeared to have a more pragmatic approach to using the virtual pathway for some patients. They accepted it was more convenient for the clinic and the patient to contact them directly for missing referral information and triaging queries, which may lead on to a virtual consultation. Appendices 2, 3 and 4 show an example map for each clinic model. It should be noted that these are examples only and not representative of all clinics for a particular clinic model. In all clinics, the virtual pathway meant using the telephone, rather than videocalls. The reasons for using a virtual or face-to-face model are shown in Table 3.

Variability between all TIA clinics and between clinics using the same model of TIA clinics was high (see Table 2). Furthermore, TIA clinic staff reported variations within

clinics where individual consultants can dictate the pathway for their patients (not shown). For example, in one of the virtual clinics, it was estimated that one consultant saw 80% of patients face-to-face. In another clinic, one consultant conducted face-to-face patient follow-ups where the usual practice was no routine follow-up offered. In all clinic models, staff reported variations to the pathway depending on whether some consultants wished to see the patient once or twice.

Twelve out of 14 (86%) TIA clinics operated a triage system for referrals (see Table 3). This percentage is consistent with a finding reported by SNAPP in their 2022 annual report (23) saying 55% of acute stroke services introduced virtual triage of patients with suspected TIA or minor stroke as part of their COVID-19 response. Two face-to-face clinics did not operate a triage system: both saw all patients, and the second clinic had an automated booking system where patients were issued an appointment on referral. Triaging patients after referral varied considerably between clinics ranging from the simple exclusion of patients not assessed to have had a TIA, risk assessment to determine the urgency for an appointment (although NICE guidance does not recommend the use of ABCD2 scoring to assess stroke risk in TIA to determine the urgency of assessment), assessment of existing patient records, to decisions on tests and imaging required, and possible preliminary diagnosis. Triaging of patients offers TIA clinics a means to improve workload management and make hospital visits more efficient, as tests and imaging can be pre-booked. Speeding up the process of diagnosis for patients with a suspected TIA supports NICE guidelines. [2] The ability to triage patient referrals was seen to depend on the quality of the referral. Additional time in the pathway is frequently required returning to primary care or other referrers for information.

Table 2: Characteristics of included clinics

Characteristic		All Clinics (n=14)	Virtual Clinics (n=2)	Face-to-face clinics (n=9)	Hybrid clinics (n=3)
Service	4 days per week	1	0	1	0
	Weekdays only	7	0	6	1
	7-day	6	2	2	2
These clinics exclude patients **at the referral stage** if suspected NOT to have had TIA		12	1	8	3
Referrals triaged	No	2	0	2	0
	Yes	12	2	7	3
	Yes, including decisions on tests and imaging required for some/ all patients	7	2	4	1
Number of patients consulted per day*	4 or less	6	0	4	2
	4-6	3	0	2	1
	6 or more	5	2	3	0
MRI/MRA availability (allocated slots per day)	Not reported	2	0	1	1
	2-3	5	1	4	0
	4-6	4	1	2	1
	None. Booked as an outpatient (unlimited access)	3	0	2	1
MRI/MRA used for all/majority of patients**		6	2	2	2
CT scan availability	Unlimited access (rarely used, MRI/MRA used in preference)	4	2	2	0
	Unlimited access (all/majority of patients)	2	0	1	1
	Unlimited access (usage not reported)	8	0	6	2
Carotid availability	Unlimited access (rarely used, MRI/MRA used in preference)	3	2	0	1
	2 slots per day (all/majority of patients)	1	0	1	0
	Unlimited (all/majority of patients)	3	0	2	1
	1-4 slots per day (usage not reported)	4	0	3	1
	Unlimited (usage not reported)	1	0	1	0
	Not reported	2	0	2	0

Characteristic		All Clinics (n=14)	Virtual Clinics (n=2)	Face-to-face clinics (n=9)	Hybrid clinics (n=3)
Clinic consultations by	Stroke consultant	14	2	9	3
	Neurologist	2	0	1	1
	Nurse consultant	2	0	2	0
	Stroke advanced clinical practitioner	2	0	2	0
	Clinical nurse specialist	1	0	1	0
	Registrar (on rare occasions)	2	0	2	0
Model of follow-up	No routine follow-up	2	0	1	1
	Virtual only	7	2	3	2
	Face-2-face only	0	0	0	0
	Virtual & Face-2-face	5	0	5	0
Time to follow-up	As requested by the patient	3	0	2	1
	2-6 weeks	6	2	2	2
	6-8 weeks	2	0	2	0
	> 3months	2	0	2	0
	Not reported	1	0	1	0
Weekend service	No service (patients use ED or are referred on Mondays)	1	0	1	0
	No service (Patients use ED or are referred on Mondays). MRI is available.	2	0	2	0
	No service (Patients use ED or are referred on Mondays). May offer advice/do phone consultation or triaging	5	0	4	1
	The clinic operates with reduced staff and or patient slots. Some imaging available	2	0	1	1
	Usual service with reduced imaging	1	1	0	0
	Usual service with the used of hospital facilities rather than the clinic	1	1	0	0
	Usual service	2	0	1	1

Where: Data are presented as n, * Patients seen reported in bands rather than absolute numbers resulting in overlapping categories, ** 8 clinics did not report usage, MRI- Magnetic resonance imaging, MRA- magnetic resonance angiography, CT-computerised tomography, ED- Emergency department

Table 3: Reasons provided for the use of virtual or face-to-face pathway

Reasons provided for using a virtual pathway	Reasons provided for using a face-to-face pathway
The demand for TIA clinic slots outstrips availability, and it is assessed as unnecessary for some patients to come into the clinic	Consultant preference
The event is suspected not to be a TIA	The patient history is uncertain and or abnormal imaging or the tests have already been completed
Low risk	The patient has had a recent stroke
The patient refuses to come into the clinic, fails to attend, or cancels the clinic appointment	The referral relates to an event over seven days previous
The patient is bed-bound, frail, physically cannot come into the clinic, or is in a nursing home	In teaching hospitals, the face-to-face pathway offers supervised patient encounters for trainee clinical staff
The patient lives a long distance from the clinic	The patient has faster access to tests and imaging as they are already in the hospital
The patient has already been seen in the emergency department or another hospital, and the imaging and tests have already been done	
There is insufficient information in the referral to triage the patient	
The consultant phones the patient for further information, and this turns into a phone consultation	
The referral is on a Sunday (no clinic), and the duty consultant may decide to phone the patient if they have sufficient time or consider the referral is urgent	

The number of patients seen in a clinic day (appointment slots) varied from three to however many referrals were received that day (see Table 2). One clinic reported running additional ad hoc clinics to catch up with demand. Availability of appointment slots was reported as driven by staffing levels, space, and imaging availability. Most clinics commented that the availability of imaging was critical to TIA clinic performance and would like more access to MRI/MRA imaging.

All TIA clinic staff agreed that the patient history is critical to diagnosis. The key difference between the virtual and face-to-face pathways was a physical examination of the patient. All clinics, irrespective of model, completed for each patient observations (vital signs), an electrocardiogram (ECG), and took blood for testing. All clinics requested a full blood set (or young blood set), but additional blood tests varied by clinic and patient. Further tests included those for urea, renal function, diabetes, liver function, electrolytes, lipids, thyroid function, calcium levels, erythrocyte sedimentation rate, and specialist tests for stroke.

Variations between TIA clinics arose with imaging options (see Table 2). MRI or MRA is the preferred first choice of imaging by TIA clinic staff and is recommended by NICE guidelines. (2) It was used for all or most patients in half of those clinics reporting on this (n=12). MRI/MRA usage was consistent with findings of the Sentinel Stroke National Audit Programme (SNAPP) 2021, which reported that '49% [of clinics] provide MRI as the first line of brain imaging for TIA patients'. (24) MRI/MRA imaging availability varied in nine clinics, ranging from three to six patient slots per day; sometimes, clinics could 'squeeze in' an extra appointment by appealing to the relevant radiology department. A further three clinics had unlimited access to MRI/MRA imaging if they booked it for their patient as an outpatient. There appears to be a similarity between the number of MRI/MRA appointment slots and patients seen, but this needs further exploration. NICE guidelines (2) recommend that an MRI be done on the same day as the assessment. Meeting this recommendation is not feasible where TIA clinics book the MRI/MRA as an outpatient appointment or where short-term demand outstrips availability.

All 14 TIA clinics had unlimited access to CT scans. Four of the six clinics reporting CT scan usage used this option rarely. It was usually used when the patient could not undertake an MRI/MRA. Twelve clinics reported carotid imaging availability; seven of these 12 clinics had unlimited access. Seven clinics reported on carotid imaging usage, three rarely using it and four for most patients. Two clinics (one face-to-face and one hybrid model) obtained a CT scan and carotid for all or most patients, though one obtained an outpatient MRI/MRA for the majority of patients too. NICE guidelines (2) recommend only using CT scanning if there is a suspicion of an alternative diagnosis to a suspected TIA. Clinics routinely using CT scanning are unlikely to be following this guideline.

Patient follow-up for TIA clinics varied from on request, to 2 weeks, to several months (see Table 2). Two clinics did not offer routine follow-up. These clinics only provided follow-up if there were changes to the patient's treatment plan or if the patient insisted. Follow-up was considered separate from dealing with outstanding test and imaging results. Where reported, all clinics (n=9) dealt with outstanding test and imaging results as they came in. No clinics offered routine face-to-face follow-up. Most clinics offered routine virtual follow-ups. The reasons for having routine follow-ups are shown in Table 4, along with the factors driving whether these are face-to-face or virtual.

Table 4: Reasons provided for follow-up and the model of follow-up

Reasons provided for routine follow-up
It is an opportunity for the patient to ask questions
To avoid miscommunication with the patients where a diagnosis has changed
To address patient queries or ongoing issues (e.g. memory issues, anxiety, blood pressure management)
It is a route to address further or new symptoms (avoid the need to return to the start of the TIA clinic pathway)
It is an opportunity to provide leaflets to patients or signpost them to other services
Factors determining virtual or face-to-face follow-up
Consultant preference
Clinic preference
Patient preference
Level of concern about patient symptoms
Clinical assessment

Without an established virtual pathway, face-to-face clinics have had some issues with their few virtual consultations. Table 5 outlines how virtual consultations in these clinics have affected routine practice.

Table 5: What is the impact of virtual consultation in face-to-face clinics?

How using a virtual pathway affects the routine face-to-face pathway in face-to-face clinics
It interrupts the routine pathway as an appointment was already booked
It can create extra pressure for the clinic if, in a virtual consultation, the consultant asks the patient to come in the next day without booking an appointment slot.
Extra work to cancel the appointment and notify the patient to expect a phone call
After a virtual consultation, the patient may visit the clinic for vitals and imaging. The order of these may differ from the usual face-to-face patient pathway in the clinic as these tasks are slotted in
There would be little impact: the patient will still enter the beginning of the patient pathway at the same point as patients using the face-to-face pathway. There may be no, or a shorter first consultation
Any virtual consultations may be in place of or in addition to face-to-face patient slots. Whether this is in place of in addition to will depend on staff availability
No impact. Any tests or imaging required from a virtual consultation will be booked as an outpatient

Two of the 14 TIA clinics used a virtual patient pathway. Whilst it is not possible to draw definite conclusions based on a sample of two, it is possible to highlight some common features. Both virtual clinics offered a 7-day service to patients, with the weekend service only affected by less imaging availability in one and the use of a shared hospital space for when patients attended for tests and imaging in the other. Virtual clinics managed higher numbers of patients seen per day. They triaged patient referrals, including decisions on tests and imaging required for some or all patients. Although these clinics did not have unlimited MRI/MRA access, they did have many appointment slots, and most, if not all, patients with a suspected TIA had MRI/MRA imaging. CT scans and carotid imaging were rarely used. Stroke consultants conducted all consultations. Follow-up continued on a virtual pathway.

One hybrid TIA outpatient clinic warrants comment as staff have changed the balance of virtual/ face-to-face that they use. During Covid, they implemented a virtual pathway and saw only a minority of patients face-to-face. Most patients had a phone consultation and came to the clinic for tests and imaging. More recently, following review, the service estimated 50-60% of patients were seen face-to-face. Staff reported the virtual clinic had been made possible during the pandemic by improved electronic records and more patients with suspected TIA referred from the emergency department. These patients often had completed some or all of the tests and imaging. Practices in the clinic have evolved into a hybrid model with more emphasis on triaging referrals, increased use of MRI/MRA imaging rather than CT scans, and a positive view about seeing more patients face-to-face.

5.2 Views workstream

A total of 15 patients and 12 healthcare professionals (8 consultant stroke physician/ neurologists, 3 nurses and 1 clinic administrator) were interviewed.

Table 6: Characteristics of patients interviewed

Patients interviewed (15)	No.
Men	5
Women	10
Under 60	3
60 and over	12
Living alone	7
Carer/dependants	2
Virtual Clinic	7
Face-to-Face clinic	8
TIA	6
TIA mimic	8
Unconfirmed at time of interview	1

Summary

- Virtual TIA clinics work well for some patients (e.g. frail elderly who may not need to have MRI/MRA imaging, older patients with co-morbidities and/or poor mobility, young working people, carers, or those living in rural areas) but not all.
- Most virtual clinics use telephone consultations and patients and clinicians did not favour video due to barriers to set-up and concerns around equity of access.
- Virtual clinics were also perceived to be better suited to parts of the pathway (e.g. triage or follow-up) or where avoiding travel was a priority.
- Being seen by a healthcare professional was very important for some patients and supported their emotional wellbeing, and the inconvenience of travel/care arrangements were sometimes acceptable trade-offs that patients were prepared to make to be seen face-to-face.
- Virtual clinics offered benefits to clinicians such as flexibility around when tasks were completed, time efficiency and time management.
- Future planning of services could consider ways to offer a hybrid models of care that respond to patient needs and preferences. However care is provided, better signposting and patient-facing information are needed to guide patients so they understand how care will be delivered; this is especially the case for hybrid and virtual models of care. The role of a TIA clinic co-ordinator was key in providing and communicating information to patients.
- Telephone and video consultations require patients and clinicians to acquire new skills and to adapt to a different way of providing and receiving healthcare (10, 11). Current clinical training focuses on face-to-face settings where non-verbal communication supports interactions. Clinicians (in particular junior staff) will benefit from specific training in communication skills for virtual care (establishing a rapport or breaking bad news may be trickier for example).

Virtual clinics

What 'virtual' means? Telephone vs video consultation

Most virtual TIA clinics in our study were conducted by telephone which was the preferred option of clinicians and many patients.

Limitations of video consultations

Video consultations were occasionally used if clinicians felt virtually 'seeing' the patient was necessary and/or the patients were able to use them. Patients were typically elderly and often had impairments or comorbidities that meant that transfer to video was not always easy during consultations, as the quote below illustrates:

"It is not that easy for patients to operate this kind of shift, so to switch to a video call through the hospital system they're not so familiar with IT things. [...] they have to go through the hospital system, send them a text message, they have to press that and that will connect their camera to my computer. I just find it that's sometimes it just doesn't happen." **(TIAS03, Consultant)**

The need to set up a video link, via the administrative team made this time-consuming and introduced delay especially when referrals or test results came in late in the day or evening. For many clinicians, it was easier and quicker to telephone a patient.

"[...] Sometimes I do these things out of hours, when we get a referral at five thirty, you then can't get them to send a video link so that eventually maybe at 8pm you speak to them. At five thirty I see the referral, I pick up the phone and speak to them." **(TIAS09, Consultant)**

Most clinicians thought video consultation added little to their consultation for the majority of patients because TIA symptoms had usually resolved at the time of the assessment, and they could not see the whole person.

However, one clinician, although not currently using them, felt there may be value in using video consultations to help rule out certain conditions when patients were not able to describe their symptoms very well.

"[...] Video component to the call may be actually very useful, for instance there are some patients with Bell's Palsy, so if you see them or talk to them from the TIA clinic, they might not be able to describe the symptom very well. But if you see them face-to-face on a video and you ask them to do one or two things you can quickly make the diagnosis, and then tell them what to do, or just send them to somewhere else." **(TIAS20, Consultant)**

Patients we spoke to were not offered a video consultation, but most said they preferred a telephone call. A few would have liked a video consultation during triage because they were comfortable using video technology or found it difficult to hear over the phone or to describe their symptoms.

"[...] I do think that if somebody had offered to sort of Skype me or Zoom me or something like that, I would've quite liked that, that would be preferable to just talking, but again it's my hearing that gives me a bit of a problem." **(TIAP11, aged over 60, virtual clinic)**

Benefits of Virtual Clinics

Better suited to some patients

Clinicians thought that a virtual clinic suited some patients, such as the frail elderly who may not have MRI/MRA imaging, older patients with co-morbidities or poor mobility, young working people, those with caring responsibilities, and those living in rural areas with financial limitations or no transport.

"[...] We've got patients that come all the way from [place] to [hospital], it's a long long way. They, you know they've got to find people to bring them, or they've got to get transport or you know, "Oh I'll have to get a taxi," and it's like it's fifty quid or something. People that have got care needs as well, so I mean they're carers for other people, quite often we get that, their husband or wife's got dementia. "Oh I can't leave them alone for too long." Those sort of people because they're generally here for about four hours, and that's not including the travel time." **(TIAS01, Stroke Specialist Nurse)**

Clinically, there were some patients that clinicians thought suited a virtual clinic better, for example straightforward clinical cases with typical TIA symptoms, (e.g. focal neurological deficit, lost vision, arm, or speech with known risk factors).

For those who did not need imaging, a virtual clinic benefited patients by reducing unnecessary travel. For more severe cases, virtual clinics prevented delay in being referred to A&E.

For most patients we spoke to who had TIA mimics, virtual clinics also worked well. They felt a virtual conversation to hear their results was appropriate, but they said they would have liked to be immediately given a face-to-face appointment to discuss their results if they had had a TIA.

Speed of TIA clinical pathway

Clinicians valued the speed of referral response enabled by a virtual clinic, and patients appreciated quick access to the TIA clinic and the timely communication of results.

"I really wanted to just get in front of someone, you know as soon as I could and if the phone call was the quickest way and easiest way of facilitating that, then that suited me." **(TIAP13, TIA mimic, virtual clinic)**

"[...] I was so surprised to have such feedback so quickly, which was very very reassuring." **(TIAP15, TIA mimic, virtual clinic)**

For TIAP04 who had a TIA mimic, it was "a pretty slick service." For TIAP08, whose inability to drive was "a serious matter" due to her caring responsibilities appreciated a phone call the evening of her tests to tell her she had not had a TIA.

"[...] I was very grateful, because it was quick. You know with something like that which has such a big effect on your life, the sooner you know if it's alright the better. **(TIAP08, TIA mimic, virtual clinic)**

Without the restrictions of face-to-face clinic slots, clinicians were able to call patients as soon as a referral came in; if in the evening this enabled clinicians to get ahead with planning for the next day of arranging scans, as well as to give tests results and diagnosis in the evenings.

"[...] I will probably in general call the patient the day before, or before I decide whether they need to be seen and then already get a history, which tends to be quite helpful because they then will obviously know whether they need to come or not. [...] then from the triage call if I know I'm doing the clinic the next day I can already then do a letter, so I can at least prepare the letter summarising the history, summarising the risk factors [...] you've got half the work done for the next day." **(TIAS09, Consultant)**

Convenience for patients

Some patients who had a TIA mimic liked the convenience of virtual clinics. TIAP04 liked the "ease of it." TIAP07 and TIAP08 did not want to travel long distances and TIAP15, who disliked big hospital environments, were happy to limit the amount of time they spent in hospital.

"[...] Personally I find it a bit of a pain going up to the hospital because I don't drive very much these days and it costs me like twenty quid in taxi there. [...] I think the phone call was adequate to be honest. [...]." **(TIAP11, TIA mimic, virtual clinic)**

Most patients we spoke to needed to go to hospital for tests but the convenience of having follow-up appointments by telephone was considered to be a good option.

Flexibility for the clinician

There were many benefits to clinicians offered by a virtual clinic, notably the flexibility it gave TIA clinic staff when delivering care. Triage was done by consultant stroke physicians/neurologists in all virtual clinics we spoke to.

Virtual clinics also offered flexibility to give patients test results in the evenings or to respond to other clinical or workload demands such as ward rounds.

"[...] there's no limit, so you know you don't need to book kind of six patients for the clinic space and no-one sitting, you know I can call the patient when the clinic room is shut. [...] sometimes you see the referral come late and say, "Alright it doesn't really look like a TIA to me, why don't I just pick up the phone and call the patient straightaway?" 5.30, all the clinics are shut, but I can still call the patient and clarify." **(TIAS17, Consultant)**

Time efficient

In virtual clinics, staff felt there were benefits accrued from spending less time physically in clinic for staff and patients. Patients can come in for their scans and go home and wait for the results. Organisation and booking of scans and contacting patients could be done by the clinic administrator, saving time for clinicians. In one virtual clinic, the co-ordination of services was easier as patients were invited to attend later in the morning for the scan due to the triage consultation having already been conducted the day before by telephone.

"[...] I just think it's a more efficient, they're not hanging around the hospital for hours on end waiting to be seen." **(TIAS26, TIA Clinic Administrator, virtual clinic)**

Virtual triage consultations tended to end "when all that needs to be said has been said," (TIAS17) whereas face-to-face consultations were 'padded' with conversation because people have travelled to their consultation.

"[...] You might probably extend that conversation a little bit longer to have a little bit of a chinwag with the patient to make them feel that you know their journey to hospital is worth it, and they spend like ten minutes with the doctor. From my point of view that time is not really adding value. [...]." **(TIAS17, Consultant)**

That said, if needed, virtual consultations could also be extended without clinicians feeling pressure due to subsequent patients sitting in the clinic waiting to be seen.

Not all staff we talked to felt virtual clinics were time efficient for clinicians, for example, if patients did not answer the call.

"I would have spent probably ten to fifteen minutes [preparing] before calling them and then it's all kind of gone to waste if you don't get through." **(TIAS24, Consultant)**

In virtual clinics, consultation, reviewing scans, phone calls, and letters tended to be spread over a longer period of time than in a face-to-face clinic.

"[...] The part of the clinician and the patient is more tedious with the virtual in terms of investigation, going back and forth. But for the face-to-face it's just one of sit there, do the investigation, get the result for them, and then that's all. **(TIAS20, Consultant)**

Good use of resources

Virtual clinics can be run from any location which, in addition to giving clinicians greater flexibility to manage their workload without additional commuting time, also enabled a wider pool of staff to provide care as they did not need to be physically present in the clinic. This supported TIA services where specialist stroke consultants were not employed.

Virtual clinics also can prevent patients making unnecessary trips to the TIA clinic and clinic slots being used when they are not required.

"We get a lot of referrals that are not strictly speaking appropriate. We do decline a fair few based on the information provided, but often the information that we ask for on the referral pro-forma is not filled out in detail. The information can be very sketchy and limited. And we end up actually seeing more patients that we should and some of them may have, already have had a CT scan for example, and after the consultation it is pretty evident that it was not something that we would need to investigate further. So if we made that decision after the phone call it means we can save a journey for them to the hospital. So in that way it saves them a lot of time and saves the hospital a fair bit of time. So there are benefits like that." **(TIAS24, Consultant)**

Disadvantages of virtual TIA clinics

Communication difficulties

By the time patients have a telephone consultation, their symptoms have usually resolved, and, in the absence of a physical examination or tests, diagnosis relies on the patient's account of their symptoms. While this can be an argument for running clinics virtually, it also presents a challenge. Clinicians interviewed described the greater difficulty in accessing information virtually when talking to patients with hearing, cognitive or language difficulties, or those who were unable to describe their symptoms effectively. Communication through a relative or carer could be problematic; not only could the call take longer, but the description of symptoms might also not be accurate.

[...] "It's sometimes difficult to make a diagnosis when you are not seeing the patient face-to-face and you cannot examine the patient. You know making a diagnosis is a holistic thing, you need to talk to the patient and get the history, some patients are very poor historians, you know. So they cannot even describe the symptom properly." **(TIAS20, Consultant)**

"I think as well on the telephone it's difficult, isn't it? Because if, especially if someone is hard of hearing or maybe they have got some cognitive issues anyway, you're talking to maybe a relative, and you don't know what the patient is, if they're trying to say anything." **(TIAS01, Specialist Stroke Nurse)**

Getting in contact with patients

Contacting patients could be more time consuming for clinicians than a face-to-face appointment and increased their workload. Multiple attempts at contacting patients, wrong telephone numbers, elderly patients who did not answer the phone and time spent talking to relatives contributed to additional clinical workload.

"It takes longer when it's virtual than if it's just face-to-face one stop clinic. It definitely it takes longer and it takes more effort on the part of the clinician." **(TIAS20, Consultant)**

Patients can be in a variety of settings when they receive their virtual TIA clinic call. Clinicians recalled patients being in restaurants, having coffee with friends or out shopping. Patients had sometimes received a phone call at time they did not expect, outside traditional clinic hours, at a weekend, evening or while in a public place and could be "caught off guard." As TIAP14 explained

"I was out shopping when I got the phone call, so I did feel I was caught off guard a little bit. [...] I just think personally a face-to-face consultation would have been better than a phone call. [...] I feel if it was maybe face-to-face, I would have been able to explain it more and they would have listened to, listened to me more." **(TIAP14, Patient)**

Lack of non-verbal communication

Virtual consultations remove many of the non-verbal aspects of communication that patients and clinicians are accustomed to in a face-to-face consultation and which they valued

"[..] all patients have mentioned it. They lose that personal connection and that reassurance of actually having that non-verbal communication side of things to reassure them [...], you know, the gestures and body language and things like that. So all of that will be missing with the telephone consultation. So there are definitely things that we miss out on by virtual things. Definitely." **(TIAS24, Consultant)**

Clinicians talked about the ways they tried to overcome the limitations of virtual consultations.

"[...] and so make sure that I create an atmosphere which simulates a face-to-face kind of situation. But I make sure that I replace something, I replace eye to eye contact you know. I feel, I make them feel the warmth about the relationship,[...] I try to show them that I'm caring, [...] It gives them much reassurance you know, because I don't have eye to eye contact." **(TIAS21, Consultant)**

Breaking bad news

Some clinicians and patients questioned the appropriateness of giving or getting a TIA diagnosis over the phone, especially for patients who live alone.

"[...] if you tell someone they've had a mini-stroke, it's not a negligible thing. You know some blood vessel in your brain is blocked and you will have questions, and just doing that as a little chat on the phone, no, not quite sure that's right." **(TIAS09, Consultant)**

Accessing information

Some patients felt a virtual clinic hindered their ability to access the information they needed because there were less opportunities to ask questions and have questions answered as they arose.

"[...] There's quite a few things here that I'm not quite sure about. I just think if it had been a face-to-face, and they'd gone through this I could've then stopped them and said, "Oh you know what, what does that mean? And what does that mean?" They could have been explained to me." **(TIAP14, TIA mimic, virtual clinic)**

In contrast, patients we spoke to who had been seen in a face-to-face clinic pathway did not mention obtaining information as a problem, and greatly valued having access to different members of staff to ask questions over a longer time period.

There were also defined parts of the pathway where some patients seen in virtual clinics felt they needed clearer signposting and opportunities to access information.

Clear signposting of what to expect in a virtual TIA clinic pathway

Clear communication of information to patients about what to expect in the virtual clinic pathway was key. Having one person co-ordinating across departments and with patients helped to create a smooth process.

"I think it helps that's there one person that's co-ordinating everything. Because otherwise I think it would get muddly if one person's sorting scans, one person's sorting other bits. So I think the fact that everything comes through me means that if there's any queries they come to me, and I know who to pass them onto. [...] I think without that communication patients get confused, they're not sure what's going to happen, they're probably anxious anyway given the clinic they're coming into. So I just think they need as much information as possible so they know what's going to happen, and what to expect." **(TIAS26, TIA Clinic administrator, virtual clinic)**

The importance of good, clear communication was also highlighted by patients seen in virtual clinics. Knowing where to go for appointments and scans and what would be involved during scans was not always clearly understood by some patients who were seen in a virtual clinic.

" [...] When [the TIA clinic] phoned me, which was on the Saturday as well, it was totally out of the blue, an unexpected, and they didn't explain that when I came to the appointment I should ask for the TIA clinic, and that I was having this thing stuck in my arm and more checks done etcetera, before the MRI scan. That would've save a lot of to-ing and fro-ing once we got there. **(TIAP07, TIA, previous TIAs, A&E referral)**

However, other patients seen through a virtual clinic pathway felt they had very clear instructions about what to expect.

Understanding medical terminology and the opportunity to ask questions

Some patients felt they had less opportunity to have medical terminology explained when communicated through a virtual clinic. They felt that they did not know what to ask in a short telephone call or did not have time to reflect and think about what they needed to know about their diagnosis and test results.

Occasionally, staff working in virtual clinics had feedback from patients that they needed further information.

"[...] it doesn't happen that often, but occasionally I will get, "Well actually I've not seen anyone face-to-face, and I just would like some reassurance," and, which I think is fair enough sometimes. You know especially when patients are elderly and they don't remember a thing that was said over the phone and they've thought of questions since." **(TIAS26, TIA Clinic Administrator, virtual clinic)**

Receiving information virtually by text could also create difficulty with understanding medical terminology.

"When I got my appointment for the clinic through, it came through as a text message and it said "Your appointment at the," what does TIA stand for? [...] That was bit of a shock I think when I saw that through a text message because I hadn't heard, I actually googled what that meant because we were calling it kind of mini stroke, and I guess then seeing that technical terminology on a text was a, I googled it because I didn't know what it meant to start with. **(TIAP19, TIA mimic)**

If given sufficient time, some patients did feel they could access enough information for their needs in the virtual consultation.

"I had a phone consultation really of well over half an hour. [...] he was great. He was just great. It was very clear and I did ask questions. Honestly I can't remember what I asked, but I was so surprised to have such feedback so quickly, which was very very reassuring. [...] It was very clear, and if there was something I didn't understand I was able to ask and that was good." **(TIAP18, TIA mimic, virtual clinic)**

Junior doctor training

Virtual clinics, involving telephone consultations, could potentially limit opportunities for some aspects of the training of junior clinicians. One aspect could be less opportunity to learn from senior staff by seeing how they take history and interact with patients.

"Sometimes more junior doctors would come and actually sit in with me during the consultation. I think that is something that is missing because they do not see how I take history, how I interact with my patients, and that would have been a good learning point, experience for them. [...] the opportunity is lost with regard to them being able to observe how I interact with patients. That is something that is missing definitely." **(TIA24, Consultant)**

Impact on patient's emotional wellbeing

Some patients preferred to "be seen" by a medical professional and valued the reassurance that gave them, which was considered to be a key disadvantage of virtual clinics and mentioned by both staff and patients.

"I think sometimes patients would prefer face-to-face as opposed to telephone. I mean not all of them, some of them are pleased that they don't have to hang around the hospital, but there are certainly some patients that you speak to them, maybe sort of a week down the line and they're like, "Well actually I haven't seen anyone face-to-face, no-one's examined me, and I'm a bit unsure, you know I've thought of questions since," and because our follow-up with the nurses is also tele-med, so if they've gone through everything and they've not seen anyone, and they've got questions sometimes they just find it I think a bit more reassuring to actually physically be seen. So I think that's probably, from a patient point of view that's a disadvantage because they would, some would prefer to physically see a doctor rather than speak to them on the phone." **(TIAS26, TIA Clinic Administrator, virtual clinic)**

For some patients it was not virtual consultations per se that they disliked, but that they felt the potential seriousness of a TIA warranted a face-to-face consultation.

"I don't have anything against telephone consultations at all. I know that some people do, but I feel that in general like our GP does it sometimes with us, and I think that there are certain things that are easily dealt with as a telephone call. I think for a TIA I would say I much preferred going to the face-to-face clinic. But in general terms I don't have any issue with it." **(TIAP27, TIA, face-face clinic)**

Potential risks and safety

One potential element raised by clinicians and alluded to by patients was the risk of missing something without physically seeing their patient, particularly when consulting through tele-med was new to them. Some clinicians mentioned that this led to them over requesting tests in virtual clinics or providing "more than the clinical scenario deserves" to ensure their clinical practice was safe.

*"[...] the problem sometimes I find that you tend to, if anything overcome the fact that you're not seeing patients by over requesting tests that might be a one of the risks. Especially at the beginning when we initially started using tele-medicine when we're not so used to it. We were very worried we would miss things."***(TIAS03, Consultant)**

Over the telephone, some clinicians felt it could be more difficult to know that their patient understood the information they were being given about the risk of a stroke, particularly if they had hearing or cognitive difficulties.

"We're not talking about a bruised knee here. It's something that's quite significant, [...]the prospect of having a stroke again isn't negligible, so, so even though many people go, "Yeah, I've just had," I dunno, "five minutes of arm weakness," it's, I think also getting that message across that it's not negligible is just better face-to-face." **(TIAS09, Consultant)**

Face-to-face clinics

Virtual clinics work well for some patients and in some parts of the pathway, but there are patients for whom the value of a face-to-face appointment is incomparable, and these patients very clearly stated it as their preferred TIA pathway.

"I do believe that face-to-face conversations are infinitely better than ones over the phone. [...] I just don't think you can beat it." **(TIAP22, TIA, face-to-face clinic)**

I would much prefer to have the journey to [hospital], and to see somebody face-to-face. [...] a hundred percent. I wouldn't have wanted it any other way." **(TIAP23, TIA, face-to-face clinic)**

The face-to-face clinic environment offered many positive aspects for these patients:

- The reassurance of 'being seen' by a medical professional
- The importance of reciprocity
- Personal connection – informal chats and interactions
- Getting test results and information straight away
- Supports holistic care

Combined together these five aspects created a sense of emotional wellbeing for patients.

The reassurance of 'being seen' by a medical professional

While the assessment of classic TIA symptoms by virtual consultation may not be complex for experienced clinicians, from a patient perspective, some patients felt they needed to be seen face-to-face at some point of the pathway to be assessed 'properly'.

"[...] I was very very happy to have the initial conversation by telephone, I mean that was great. But I wouldn't have felt safe or happy if a diagnosis would've been made without maybe not an MRA but without at least a physical examination." **(TIAP16, TIA mimic, virtual clinic)**

Patients for whom a face-to-face appointment was important were willing to trade off the inconvenience of travel, time or cost to be seen in person. TIAP15 took two taxis to her face- to-face clinic appointment.

"I was happy having face-to-face I have to say, even though it's a journey because they could see by looking at me that I wasn't well, you know, when you talk to somebody over the phone it's a completely different thing." **(TIAS23, TIA, face-to-face clinic)**

For some clinicians running face-to-face TIA clinics, there were also benefits in seeing their patient in person, for example, to provide extra information and manage tricky and complex cases.

"People have got to come in for their investigations, so we felt it was much better for them to come in and see a specialist, to get a definite diagnosis, which is often easier I think in some of these very complex histories when you see people face-to-face, and often actually there's still some subtle neurology that hasn't been picked up in A&E, or by whoever saw the patient first, and it means that you actually have the opportunity to examine them because it's one of the only things, well obviously we see people face-to-face on a daily basis but our follow-up clinics and things are still all virtual. So it's the chance to see people and actually make sure there isn't anything else that we're missing." **(TIAS05, Consultant)**

The importance of reciprocity

An important benefit of the face-to-face clinic for some patients is the opportunity it gave them to ask questions that might have arisen before or during their appointment, and to feel reassured by the healthcare professional(s) who listened and responded to them. This reciprocal process could happen several times over the course of the face-to-face appointment.

"[...] I asked all the questions that I needed to, but I think if I'd have had a virtual appointment I probably wouldn't have done. [...] you feel like you're taking up their time. When you're actually in an office with them you know that they are there for you. Whereas on the phone they might be having, they might have another patient outside, so you feel a bit more rushed I think." **(TIAP23, TIA, face-to-face clinic)**

It was possible to create this reciprocal process in a virtual clinic but this required time, and patients needed to be prepared for their virtual clinic telephone call.

"[...] the very next day I had a phone call from the TIA clinic and he was absolutely wonderful, and just talked me through what had happened. I had a phone consultation really of well over half an hour [...] he was great. He was just great. It was very clear and I did ask questions. [...] It was very clear, and if there was something I didn't understand I was able to ask and that was good. [...] that's one of the reasons why I sort of say about my mobile, I'd rather just talk on my main phone, so I'm sort of sitting down, rather than, I couldn't have done this over my mobile if I'd been out and about for example." **(TIAP18, TIA mimic, virtual clinic)**

Personal connection – informal chats and interactions

Personal connection was also important to patients and clinicians. For patients seen in the face-to-face clinic, the opportunity for interactions with multiple healthcare professionals, rather than just one clinician over the phone was particularly beneficial.

"[...] I think if we bring people in and see them face-to-face they get the opportunity to see the stroke nurse specialist, and have some of the lifestyle factors and things discussed that we don't always have time to do as medics. So we work really well as a team. You know one of us is seeing someone while someone else is speaking to another patient." **(TIAS05, Consultant)**

Informal chats while being taken to and from tests, or between staff while waiting in clinic reinforced a feeling of reassurance and information-sharing set within the familiarity of a normal routine of going into hospital and 'being seen' by multiple people.

"[...] I did speak to two or three nurses on the team or doctors [...] and to actually have a chance to directly speak to the people who are involved, who do work with this all day every day, it's part of their life, when I come to it completely ignorant, I found a great help. Great help. Very reassuring. [...] [Over the telephone] totally different because they would have asked me questions, I would have given answers and not been able to explore it further." **(TIAP25, TIA, face-to-face clinic)**

Personal connection with healthcare professionals benefited patients' emotional wellbeing. Establishing the same level of rapport is possibly harder to do in a telephone call.

"[...] I felt like I was on another planet really. And I think if I'd have had virtual appointments I think I would have been worse, because I wouldn't have really known what was going on. Being sick and when I saw [nurse] face-to-face and she was very calm and explained everything to me [...] I just felt a lot more at ease when I spoke to her." **(TIAP23, TIA, face-to-face clinic)**

For some clinicians, seeing their patient face-to-face, and the personal connection and rapport they developed with their patients was an important aspect of their job satisfaction.

"[...] But I know for those two [nurses] there, the actual face-to-face is quite important. It's an important part of their job, it's part of the reason they do it because they enjoy that aspect of it." **(TIAS01, Stroke specialist nurse)**

Getting test results and written information straightaway

In a face-to-face clinic patients can usually have the results of some tests straight away that then can be discussed in person with a health care professional together with a plan of management, which benefited the emotional wellbeing of patients. There was no need to 'wait' and 'wonder' when they will be called.

"[...] the face to face clinic just made me feel more reassured I guess than a telephone call and you always worry with a telephone call, is it going to come? What time is it going to come? What was nice is that I knew when I was walking out that clinic I would know one way or the other the results." **(TIAP19, TIA mimic, face-to-face clinic)**

Opportunity for patients to take written information away with them from the face-to-face clinic was another perceived benefit.

"Not only the staff are there to educate patients but we've developed our own TIA clinic information leaflet which gives patients quite a lot of information and we can personalise it to that individual. So that gets completed in clinic and they've got that information to go away with, because I think quite often we give people so much information it's very difficult to take on board. So they have that that they can think about, and then they get a copy of the letter that's sent to the GP." **(TIAS05, Consultant, face-to-face clinic)**

Supports holistic care

Clinicians involved in running face-to-face clinics felt the face-to-face clinic environment supported holistic care by providing access to other therapies and services that could be attended immediately while patients were in clinic. Importantly, if referrals were required for inpatient admission and surgery, they could be done straightaway while the patient was still in clinic rather than involving multiple telephone calls.

"It helps with getting the imaging, because we can get not only the neck imaging, head imaging if we need it, if we find someone has a significant carotid stenosis they stay in the clinic, the vascular surgeons come and see them and make an immediate management plan. And if we were seeing those patients virtually we'd have multiple multiple conversations, and, yeah trying to get them in. Whereas if the vascular surgeon sees someone they might go, "Brilliant, we'll operate on them later this week, this is the plan" if they have anything else to do, and it's all sorted out, so for the patients it's a much better service I think. In our experience here anyway. **(TIAS05, Consultant)**

Hybrid Clinics (A blended approach of virtual and face-to-face)

The key advantage to offering a hybrid clinic was the flexibility to adapt to patient preference or need and to offer choice.

Another advantage of a hybrid clinic is that it enables juniors to have access to training in a face-to-face clinic.

"[...] [one day a week] clinic so we're always face-to-face, even the straightforward, most straightforward patients will come face-to-face, so that juniors can just go and check and then discuss the patients with the patients there with us, so if we have any additional questions and clarifications, because otherwise it would be like a round of phone calls, either they need to go and call the patient, clarify it, tell us, so it's not nice for patients. So we just have them, that's for training. So that's when we train our juniors. **(TIAS17, Consultant)**

5.3 Environmental sustainability workstream

Summary

- The published literature and interview responses indicate that there is a clear need for virtual consultations; acceptability and feasibility for delivering such services are high on the part of both patients and staff; and their benefits with regards to reduced carbon emission, efficiency and flexibility are evident.
- However, a refined referral system needs to be developed and adopted enabling providers to better decide which type of patients would be best for this type of care, and to take into consideration wider system factors (e.g. in the design and adoption of virtual services) and the preferences of patients/carers.

Through the literature review, a reduction in carbon was unanimously reported, primarily due to reductions in travel for patients and, on occasion, staff. The papers used a range of methods and assumptions to determine carbon savings, and despite methodological inconsistencies, all papers concluded that virtual consulting significantly reduced carbon emissions. (20) This reduction was supported by our

analysis of interviews which evidenced that, not only can virtual consultations result in TIA patients travelling significantly less (an average of an hour round trip per patient), but they can also save patients time, energy and stress in the face of public transport issues. For those with mobility or care needs, or with partners/family at home with impaired abilities like dementia, virtual consultations can provide a great alternative.

One of the biggest concerns with virtual consultations for TIA is that patients often need to come into hospital for tests, scans and ECGs, so consultation appointments are usually arranged at the same time. Furthermore, as patients need to travel into the clinic anyway, there is a concern (reflected in interviews and some literature) that virtual consultations do not necessarily reduce travel. There was also limited consideration of wider factors about health services in the literature which the interviews similarly highlighted in relation specifically to TIA services. Patients interviewed stated they appreciate 'the personal touch' from face-to-face appointments; patients want to know that their clinicians understand them, their circumstances, their needs and that they can observe their emotions directly—especially with medical conditions which are life threatening. Whilst many appreciate that the use of virtual consulting is increasing and reflects a modern way of working, interviewees (both staff and patients) often felt that the NHS's overriding strength is that it is a people organisation, and hence seeing patients face-to-face is the optimal approach. While there is limited clinical evidence per se (in the literature reviewed or in the interviews), patients were concerned about misdiagnosis; they felt the quality of the care may be reduced from virtual consultations.

On a final note, healthcare professionals appeared to prefer their consultations face-to-face; while a lot of staff can do their consultations working from home, at times they choose to come in as they prefer to keep work and home life separate.

5.4 Use of resources workstream

Summary

- There were no statistically significant differences in terms of mean cost, between the hybrid and face-to-face models of care.
- The virtual model of care was associated with both a lower mean number of investigations and a lower mean duration of care than the face-to-face model, while the hybrid model was associated with a higher mean number of investigations, but a lower mean duration of care than the face-to-face model but this is likely to be due to differences in practice between clinicians and access to investigations, as no statistical matching was performed.
- If the hybrid model was optimised to allow a smoother transition from virtual into a face-to-face this would increase the efficiency of this model of care further.

The mean costs of the three models (in Appendix 7) were similar to each other ($p>0.05$); the virtual model had a mean additional cost of £51 (t-test $p=0.070$, 95%CI -4 to 106) compared to the face-to-face model while the hybrid model was associated with a mean total cost reduction of £8 (t-test $p=0.457$, 95%CI -27 to 12). However, both virtual and hybrid models had statistically significantly lower mean durations than the face-to-face model (Appendix 8). The virtual model had the lowest mean duration at 157 minutes (SD 33) and a mean difference of -18 minutes (t-test $p<0.001$, 95%CI -24 to -12) compared to the face-to-face model, while the hybrid model had a mean difference of -14 minutes (t-test $p=0.001$, 95%CI -22 to -6) compared to the face-to-face model.

We found that hybrid models involved patients switching from a virtual to a face-to-face model of care and that patients would have to restart their journey from the start (i.e. referral or TIA clinic appointment booking stage). This resulted in cases of duplication which in turn increased the use and cost of resources associated with the hybrid model.

The lower mean duration of the virtual model was mainly driven by the lower number of investigations conducted within this model of care (Appendix 9). Compared to the face-to-face model, the virtual model had a statistically significantly lower number of CTAs (-0.22, t-test $p<0.001$, 95%CI -0.25 to -0.19), carotid duplex scans (-0.14, t-test $p<0.001$, 95%CI -0.23 to -0.05), ECGs (-0.26, t-test $p<0.001$, 95%CI -0.35 to -0.18), and blood pressure tests (-0.28, t-test $p<0.001$, 95%CI -0.36 to -0.19). The mean number of investigations was less than one as many pathways did not involve investigations. However, compared to the face-to-face model, as there was only one hybrid model to compare against and there was no variability in the investigations performed. The mean number of investigations per pathway for the hybrid model was higher than the face-to-face model for most types of investigations including CTs (0.70, t-test $p<0.001$, 95%CI 0.67 to 0.73), carotid duplex scans (0.31, t-test $p<0.001$, 95%CI 0.28 to 0.34), ECGs (0.14, t-test $p<0.001$, 95%CI 0.12 to 0.16), blood tests (0.44, t-test $p<0.001$, 95%CI 0.40 to 0.47), and blood pressure tests 0.13, t-test $p<0.001$, 95%CI 0.11 to 0.15). Of note, as no matching was performed in this study, the differences in the number of investigations observed between model types were more likely to be due to differences between clinicians and access to investigations between hospitals rather than the model of care per se.

6 Conclusions

6.1 Main findings

This evaluation has identified wide variation exists in TIA outpatient clinics across the South East region, irrespective of the model used. Currently, most services use the traditional face-to-face model of delivering care. However, there was wide acceptance virtual consultations are appropriate and even preferable in specific contexts (particularly for triage and follow-up). Lack of availability of imaging (particularly MRI) was raised as a concern and a constraint to efficient service delivery by healthcare professionals during both the pathway mapping and interviews.

Benefits of the virtual model:

- Patients are able to move through the steps of diagnosis and management more rapidly.
- Reduction in time and costs spent on travelling for patients, with associated reduction in carbon emissions.
- Patients and carers valued virtual consultations, particularly when they had limited access to transport, needed to provide care for a dependent and/ or had limited mobility.
- For healthcare professionals, there was greater flexibility to manage the TIA service around other clinical demands and the option to call patients outside of standard outpatient clinic times.

Challenges of the virtual model:

- Challenges around communication and building a rapport when using the virtual model. Patients and healthcare professionals considered this to be easier when being seen face-to-face.
- Patients explained a lack of information was provided on what to expect at a virtual appointment.
- It was harder to access support and information following being given a diagnosis of TIA over the phone. Given the significance of the diagnosis, this was a worry for patients and they felt there emotional well-being was impacted.
- Clinicians found the model could be inefficient due to having to try several times to call patients and the risk of misdiagnosis and over requesting of investigations to mitigate this.

Irrespective of the model used, efficiencies can be achieved by use of a refined referral system, undertaken by senior members of the TIA team (such as consultant

stroke physician or neurologist), identifying which patients are best for which model, considering wider system factors. This may support services to address issues around clinical capacity and imaging requirements.

6.2a Recommendations for TIA services

- Services would benefit from placing greater emphasis on effective triaging of referrals and from this deciding the most appropriate pathway for the patient, rather than routinely seeing all referrals. Patient preference for a face-to-face or virtual appointment should be considered as part of the triaging process. Those with a definite or probable diagnosis of TIA may benefit from a face-to-face appointment when the diagnosis is confirmed.
- TIA clinics should establish a virtual pathway for patients, even if it is rarely used, to avoid impacting the face-to-face pathway. This flexibility could contribute to managing the variable demand for the TIA service and capacity constraints. Minimising the duplication across pathways would allow for better patient flow and integration of services between virtual and face-to-face models of care to reduce the use of unnecessary resources.
- Provide better signposting and patient facing information so patients understand how care will be delivered, especially for virtual and hybrid models.
- Prioritise virtual clinics only where travel is authentically saved, e.g. patients who are travelling to hospital for tests, scans and ECGs could receive face-to-face consultations as appointments can potentially be combined.
- Collection of routine data by services for monitoring and evaluation. This could be through the TIA dataset (currently optional) within the clinical audit section of SSNAP (Sentinel Stroke National Audit Programme), alongside the relevant section on neurovascular/ TIA services within the SSNAP acute organisational audit. [3]
- Provide training for healthcare professionals (particularly junior staff) in communication skills for virtual care (such as establishing a rapport/ breaking bad news).
- The sharing of process maps may highlight good practices for other TIA clinics. On an individual TIA clinic level, participating clinics could take the process maps from this study and explore the maps further to improve the patient pathway in their clinic.

6.2b Recommendations for further evaluation and research

- Hybrid models of TIA clinics may offer the most significant potential for improvement in TIA patient pathways. Research should evaluate this model further and establish standardised pathways for the virtual and face-to-face routes and consider the allocation of resources in hybrid models of care.
- Further research should explore triaging of referrals and seek to establish best practices for this part of the pathway irrespective of the clinic model. This research should include obtaining missing information directly from the patient, possibly leading to an initial phone consultation.
- Explore the feasibility of community diagnostic centres providing all investigations for a TIA service, undertaking a small pilot study to see whether timelines can be met. [2, 3]
- Review if the threshold for requesting investigations is lower if a patient is seen face-to-face.
- Research whether the virtual model causes a delay in patients starting treatment for secondary prevention and whether this impacts on longer term outcomes.
- Study the patient perspective as part of the costings (such as patients' and their carers' time off work, travel time to clinic and waiting times in the clinic). Also, to control for the variability within and between the clinics to better address the questions of cost efficiency.
- Further research should explore to what extent and how clinics are adopting standards from NICE guidance on TIA diagnosis and management, are these appropriate and whether they could be recommended to all clinics.
- Further qualitative research is needed to ensure interviews with diverse patient populations and locations, and increased potential for transferability of findings.
- Consider research using patient postcodes and information about mode of travel, to enable quantitative carbon savings to be accurately calculated for the three models.

6.3 Limitations

- The small number of virtual and hybrid clinics raises uncertainty in any conclusions drawn from these clinic models. Variability between clinics meant it was not possible to produce a map to show a 'good' pathway for each model of TIA outpatient clinic. The study produced multiple process maps for analysis. These maps highlighted the variability more than the common elements. Feedback on draft pathway maps was poor, resulting in missing information and uncertainty in parts of the pathways. The project would have benefitted from further time to go back to the clinics once all the maps had been drafted, to ask further questions about aspects of the maps raised

by some clinics and not discussed by others. Process maps are a snapshot of patient pathways and clinics are evolving workplaces. Pathways may have changed during the six months between the initial meeting and reviewing of draft process maps.

- Participation:
  - Busy clinics meant it was difficult for clinics to participate in the study and for clinics that did participate for multiple staff to attend meetings. Winter pressures and strike action exacerbated this.
  - The lack of whole team participation meant seeing the pathway from different people's perspectives was lost, and process maps may not be a true reflection of the pathways.
  - There was a disproportionate number of stroke consultants attending the discussions.
  - Where only one or two staff attended the meeting, there could have been a bias in the portrayal of the pathway to support an individual's preference for the virtual, face-to-face, or hybrid clinic models.
- Patients should be involved in future process mapping of TIA clinics so that their experiences of the pathways are included. Also, process mapping should be in person on the hospital site. The sessions would be more efficient. Maps could be discussed, and a consensus reached in one session. The sessions would be more interactive and inclusive.
- The small number of patients interviewed provided little insight into communities which experience deprivation and discrimination.
- Both the interviews and systematic review provided an overview of the environmental benefits, and challenges, of adopting virtual consulting services. However, the sample size of patients and staff interviewed was small, meaning it is hard to make conclusions that can be generalised across the population.
- It was not possible to determine the postcodes of patients meaning we were not able to quantify the exact carbon savings from transitioning to virtual consultations. While the literature review focused on virtual consulting generally, interviews focused specifically on virtual consulting in the context of specific services and care for TIA. This is a life-threatening condition with potentially highly emotive interactions and a number of physical tests and examinations required, which likely shape the views of patients and staff about the use of virtual consultations over face-to-face.
- We could not define what investigations were appropriate for individual patients. Our original study design involved administering a clinician completed bespoke questionnaire at an individual patient-level, but due to time and resource constraints this was changed to a site-level data collection approach after

discussion at the Steering group. Assumptions made regarding investigations performed in some pathways may not reflect real-world practices. The time taken by healthcare professionals to provide care and the duration of each clinical investigation performed were mainly estimated from clinical experts and we did not have data regarding the proportion of patients entering each care pathway to provide an accurate estimation of the mean cost and duration of each model of care.

- We did not account for the cost and time saved by patients that attended virtual clinics due to a reduction in patient travel and waiting times, as this analysis was from the clinic perspective.
- We did not consider the volume of patients in the costings. If more patients might be seen in the virtual or hybrid clinic, this will underestimate the duration and cost of these models.

7 Ethics statement

The qualitative interview workstream obtained ethics approval from the East of England – Essex Research Ethics Committee on 1st December 2022.

8 Acknowledgments

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The views expressed in this report are those of the authors and not necessarily those of NHS England, the National Institute for Health and Care Research, or the Department of Health and Social Care.

9 Conflicts of interest

No conflicts of interest were identified for any members of the Project group or Steering group.

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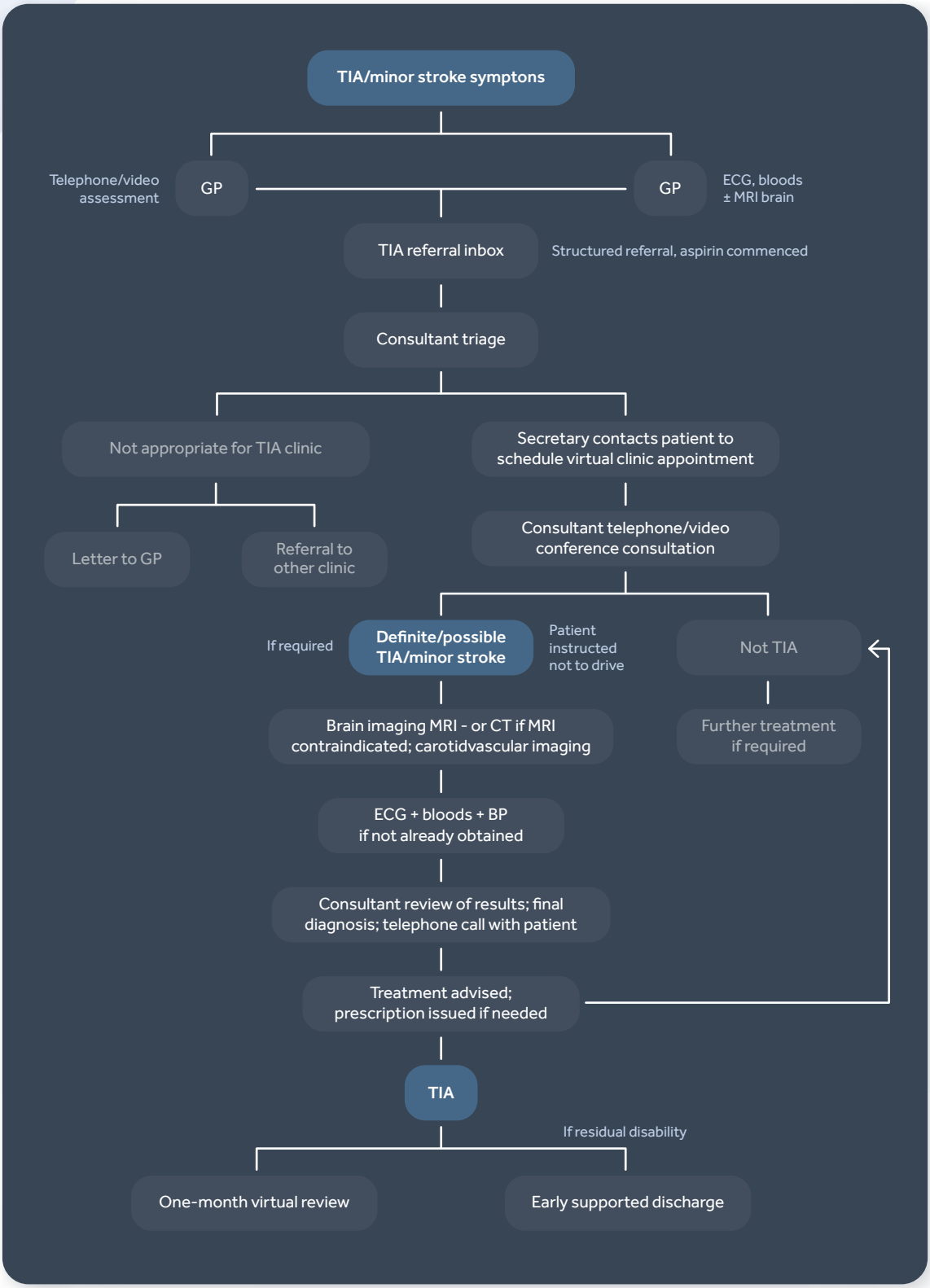
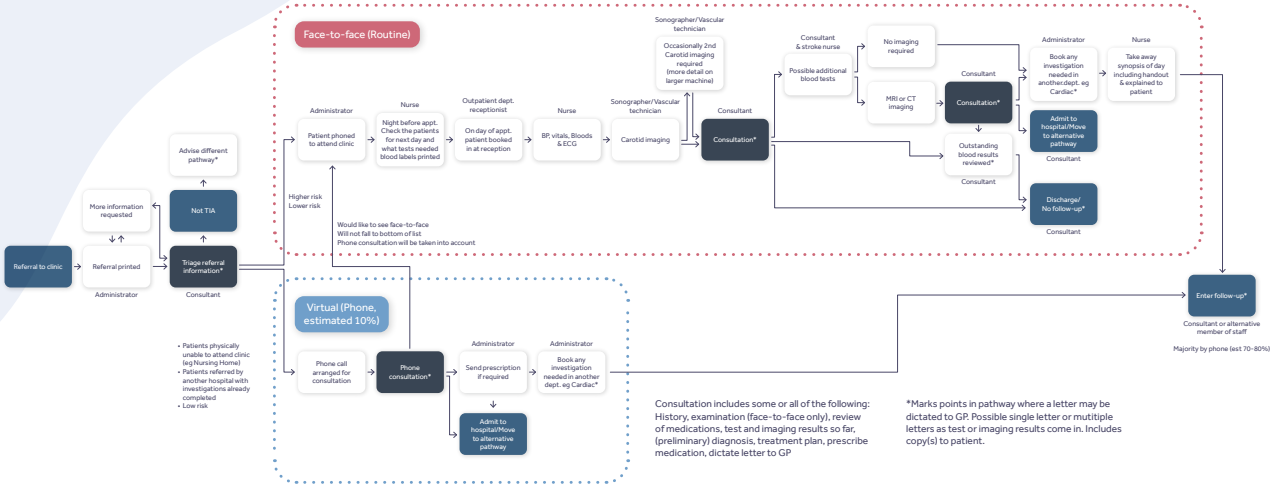
11 Appendices

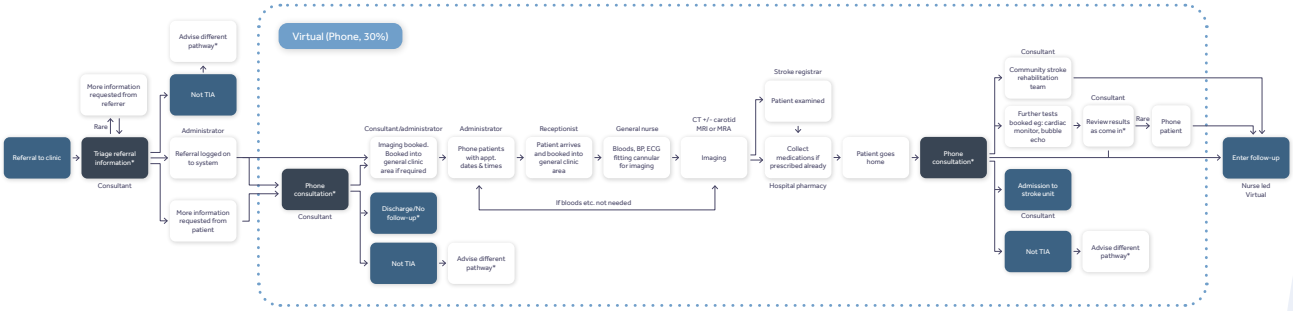
Appendix 1: Suggested Virtual clinic pathway for managing TIA/ minor stroke in the COVID-19 pandemic [1, p27]



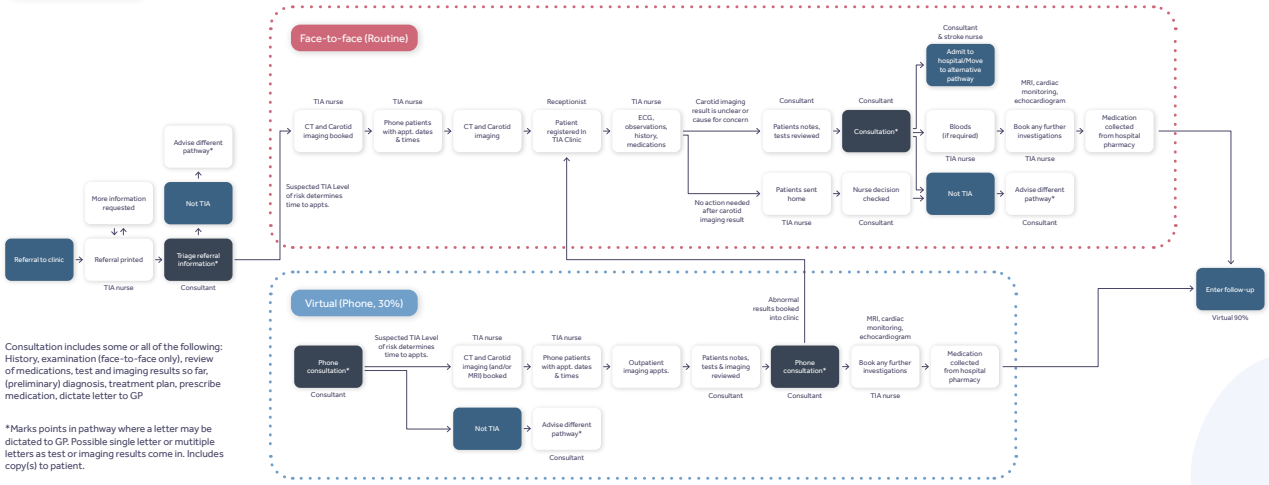
Appendix 2: Example pathway for face-to-face TIA outpatient clinic model



Appendix 3: Example pathway for virtual TIA outpatient clinic model



Appendix 4: Example pathway for hybrid TIA outpatient clinic model



View enlarged versions of Appendix 2, 3 and 4
https://indd.adobe.com/view/45a456d0-34ea-460e-a293-fcfd77a4e784

Appendix 5: Use of resources data points

Data point	Duration recorded	Cost recorded
Site	No	No
Source of referral - GP - Secondary Care Specialist - Emergency Department	Yes	Yes
- Triage Profession performing triage	Yes	Yes
What type of TIA clinic was booked. - Face-to-face - Virtual	No	No
Who scheduled TIA clinic appointment	Yes	Yes
Pre-clinic assessment - Who performed the assessment. - What activities take place during the assessment	Yes	Yes
Consultations - Up to three in a pathway - For each recorded who conduct's it and if in person or on the phone	Yes	Yes
Investigations conducted through the TIA clinic. - Imaging: CT, CTA, MRI or MRA (only one of them) - Carotid duplex - ECG - Blood pressure - Bloods (FRC, U&E, Lipid profile, TFT, LFT, glu/BM other) *if conducted in ED these have been represented on the data sheet but not as part of the pathway*	Yes	Yes
Outcomes of investigations - Yes TIA - Not a TIA	No	No
Post clinic administration. - Dictation of letters - Typing of letters - Checking of letters - Review of any outstanding results - Further communication with the patient - Sending out of letters	Yes	Yes
One month follow up. - If one would be booked - Who would book it	Yes	Yes

Appendix 6: Unit cost of clinic staff inputs and investigations, in 2020/21£

Resource	Unit	Unit cost	Source
Ambulance service	per contact	268	(NHS England, 2022)
Band 5 nurse	per hour	41	(Curtis et al., 2021)
Band 6 nurse	per hour	51	(Curtis et al., 2021)
Band 7 nurse	per hour	65	(Curtis et al., 2021)
Band 8a nurse	per hour	75	(Curtis et al., 2021)
Blood pressure test	per investigation	3.61	(NHS England, 2022)
Blood test	per investigation	4.75	(NHS England, 2022)
Carotid duplex	per investigation	111	(NHS England, 2022)
Clinic administrator	per hour	11.11	(NHS Employers, 2022)
CT	per investigation	136	(NHS England, 2022)
CTA	per investigation	153	(NHS England, 2022)
ECG	per investigation	149	(NHS England, 2022)
Emergency department	per hour	52	(Curtis et al., 2021)
General Practitioner	per hour	39	(Curtis et al., 2021)
Healthcare assistant	per hour	10.37	(NHS England, 2022)
Healthcare technician	per hour	11.11	(NHS England, 2022)
Medical consultant	per hour	123	(Curtis et al., 2021)
MRI	per investigation	246	(NHS England, 2022)
Radiographer	per hour	43	(Curtis et al., 2021)
Secondary care specialist	per hour	52	(Curtis et al., 2021)
Secretary	per hour	11.11	(NHS England, 2022)
Sonographer	per hour	66	(Curtis et al., 2021)
Specialist nurse	per hour	51	(Curtis et al., 2021)
Support worker	per hour	10.37	(NHS England, 2022)
Time-of-flight MRA*	per investigation	754.05	(Collins et al., 2007)

*Unit cost has been inflated to 2020/21 prices using the PSSRU Hospital & Community Health Services (HCHS) Index (Curtis et al., 2021). CT: computed tomography, CTA: computed tomography angiography, ECG: electrocardiogram, MRA: magnetic resonance angiography, MRI: magnetic resonance imaging.

Appendix 7: Mean cost of clinic resources per pathway by model of care, in 2020/21£

	Face-to-face (n=9)	Virtual (n=2)	Hybrid (n=1)	Virtual vs. Face-to-face		Hybrid vs. Face-to-face	
	mean (SD)	mean (SD)	mean (SD)	mean difference (95%CI)	p*	mean difference (95%CI)	p*
Clinic staff	213 (53)	188 (28)	202 (31)	-25 (-31 to -19)	<0.001	-10 (-25 to 4)	0.147
Investigations	402 (201)	477 (301)	404 (0)	76 (24 to 128)	0.004	3 (-10 to 16)	0.669
Total cost	614 (227)	665 (318)	607 (31)	51 (-4 to 106)	0.070	-8 (-27 to 12)	0.457

* p-value was computed using t-test.

Appendix 8: Duration of clinic resource inputs per pathway by models of care, in minutes

	Face-to-face (n=9)		Virtual (n=2)		Hybrid (n=1)		Virtual vs. Face-to-face		Hybrid vs. Face-to-face	
	mean (SD)	range	mean (SD)	range	mean (SD)	range	mean difference (95%CI)	p*	mean difference (95%CI)	p*
Clinic staff	129 (27)	75-200	111 (26)	65-155	105 (16)	85-120	-18 (-23 to -13)	<0.001	-24 (-31 to -16)	<0.001
Investigations	45 (19)	0-75	46 (20)	0-75	55 (0)	55-55	0 (-3 to 4)	0.846	10 (8 to 11)	<0.001
Total cost	174 (38)	75-270	157 (33)	65-225	160 (16)	140-175	-18 (-24 to -12)	<0.001	-14 (-22 to -6)	0.001

Appendix 9: Mean number of investigations per pathway by model of care

	Face-to-face (n=9)	Virtual (n=2)	Hybrid (n=1)	Virtual vs. Face-to-face		Hybrid vs. Face-to-face	
	mean (SD)	mean (SD)	mean (SD)	mean difference (95%CI)	p*	mean difference (95%CI)	p*
MRI	0.28 (0.45)	0.28 (0.45)	0 (0)	-0.0003 (-0.08 to 0.08)	0.994	-0.28 (-0.31 to -0.25)	<0.001
Time-of-flight MRA	0.06 (0.24)	0.28 (0.45)	0 (0)	0.22 (0.15 to 0.3)	<0.001	-0.06 (-0.08 to -0.05)	<0.001
CT	0.30 (0.46)	0.28 (0.45)	1 (0)	-0.02 (-0.10 to 0.06)	0.664	0.70 (0.67 to 0.73)	<0.001
CTA	0.22 (0.41)	0 (0)	0 (0)	-0.22 (-0.25 to -0.19)	<0.001	-0.22 (-0.25 to -0.19)	<0.001
Carotid duplex	0.69 (0.46)	0.55 (0.5)	1 (0)	-0.14 (-0.23 to -0.05)	0.002	0.31 (0.28 to 0.34)	<0.001
ECG	0.86 (0.35)	0.60 (0.49)	1 (0)	-0.26 (-0.35 to -0.18)	<0.001	0.14 (0.12 to 0.16)	<0.001
Blood test	0.56 (0.50)	0.60 (0.49)	1 (0)	0.03 (-0.06 to 0.12)	0.472	0.44 (0.40 to 0.47)	<0.001
Blood pressure test	0.87 (0.33)	0.60 (0.49)	1 (0)	-0.28 (-0.36 to -0.19)	<0.001	0.13 (0.11 to 0.15)	<0.001

* p-value was computed using t-test. CT: computed tomography, CTA: computed tomography angiography, ECG: electrocardiogram, MRA: magnetic resonance angiography, MRI: magnetic resonance imaging.

Appendix 10: Evaluation Team

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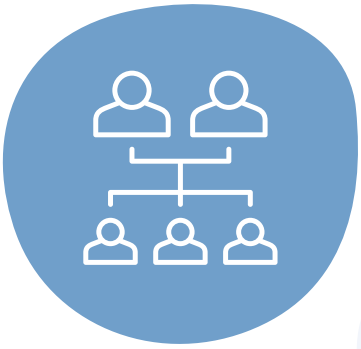

Health Innovation
Oxford & Thames Valley

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Evaluating the role of virtual transient ischaemic attack (TIA) outpatient clinics

Main Evaluation

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