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Considerable patient and physician delay in suspected TIA

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Considerable patient and physician delay in suspected TIA

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Abstract

Objectives

Suspected Transient Ischaemic Attack (TIA) necessitates an urgent neurological consultation and a rapid start of antiplatelet therapy to reduce the risk of early ischaemic stroke following a TIA. Guidelines for general practitioners (GPs) emphasise the urgency to install preventive treatment as soon as possible. We aimed to give a contemporary overview of both patient and physician delay.

Methods

A survey at two rapid-access TIA outpatient clinics in Utrecht, The Netherlands. All patients suspected of TIA were interviewed to assess time delay to diagnosis and treatment, including the time from symptom onset to i) the first contact with a medical service (patient delay), ii) consultation of the GP and iii) assessment at the TIA outpatient clinic. We used the diagnosis of the consulting neurologist as reference.

Results

Of 93 included patients, 43 (46.2%) received a definite, 13 (14.0%) a probable, 11 (11.8%) a possible and 26 (28.0%) no diagnosis of TIA. Median patient delay was 17.5 (IQR 0.8-66.4) hours, with a delay of more than 24 hours in 36 (38.7%) patients. The GP was first contacted in 76 (81.7%) patients, and median time from first contact to the GP consultation was 2.8 (0.5-18.5) hours. Median time from GP consultation to TIA service visit was 40.8 (IQR 23.1-140.7) hours. Of 62 patients naïve to antithrombotic medication, 27 (43.5%) received antiplatelet therapy from the GP.

Conclusions

There is substantial patient and physician delay in the process of getting a confirmed TIA diagnosis. As a result in too many patients proper preventive treatment is initiated too late.

Key words: TIA, minor stroke, patient delay, physician delay

Strengths and limitations of this study

- We interviewed patients suspected of TIA before the definite diagnosis was established, thus without bias caused by knowledge of the final diagnosis.
- We were able to provide precise estimates of the different components of the total pre-hospital delay time.
- We also assessed whether antiplatelet therapy was initiated prior to the neurologist's assessment.
- In 11 of 93 cases we used an expert panel to determine the diagnosis of TIA, in absence of a conclusion of the consulting neurologist.
- Our cohort is relatively small, but large enough to provide these estimates of current time delay in patients suspected of TIA.

Introduction

A Transient Ischaemic Attack (TIA) is a medical emergency, as the risk of a subsequent ischaemic stroke following a TIA is highest in the early stage. Urgent neurological consultation followed by proper stroke preventive treatment reduces this risk substantially, with the rapid start of an antiplatelet agent as key intervention.[1, 2]

Previous studies indicated that around 30 to 40% of patients with TIA delay contacting a medical service for more than 24 hours.[1, 3, 4] Over the past decade, patient awareness campaigns like FAST aimed for better recognition of and a quick response to symptoms suspected of stroke to enable thrombolysis or invasive treatment within the first hours.[5] Although TIA is part of the acute ischaemic brain spectrum, it is unknown whether campaigns like this also positively affect acting upon symptoms that are transient, typically short-lasting and often less distinct.

The EXPRESS study (2007) laid the foundation for a drastic decrease of physician delay to diagnosis and treatment of TIA, i) by the development of rapid-access TIA services, and ii) guidelines for general practitioners (GPs).[1] The Dutch GP guidelines recommend GPs to refer all patients suspected of TIA to a TIA service within 24 hours, and to immediately initiate a platelet aggregation inhibitor, unless it is certain that the patient will be examined by a neurologist on the same day.[6] The UK guidelines recommend the use of the prognostic ABCD2 score (Age, Blood pressure, Clinical features, Duration, Diabetes) to define high-risk patients that have to be examined by the neurologist within 24 hours, but emphasise an immediate start of medication by the GP in any suspected TIA patient.[7]

We aimed to assess current patient and physician delay from onset of suspected TIA symptoms to specialist consultation.

Methods

We conducted a survey among patients suspected of TIA who were referred to one of two participating rapid-access TIA services in the city of Utrecht, The Netherlands. Consecutive patients were asked to participate when arriving at the TIA service. Patients were excluded in the case of: (1) ongoing symptoms; (2) onset of symptoms in-hospital or outside the Netherlands; (3) severe cognitive impairment; (4) inability to clarify the time of onset of symptoms.

We collected information about the following items: (1) the interval from onset of symptoms to the patient's first contact with a medical service, the interval to the GP visit, and the interval to the TIA service visit; (2) the initiation of an antiplatelet agent; (3) the type and duration of symptoms; (4) the initial reaction of the patient (what did the patient do?); (5) the initial perception (what did the patient think?); (6) general knowledge of TIA. In case a patient had experienced multiple recent (suspected) TIAs, we evaluated the last event.

We considered the consulting neurologist's diagnosis of TIA as reference. Diagnoses were categorised as definite TIA or minor stroke, probable TIA, possible TIA, or no TIA. In 11 cases (11.8%) the neurologist's conclusion was unclear or absent, and three clinicians (LSD,LJK, FHR) decided in a consensus meeting on the diagnosis.

Delay is presented as median with 25-75% interquartile range (IQR). In an overview of results per interview item, we additionally compared results between those with a definite or probable TIA (or minor stroke), and those with no or a possible TIA, applying Chi square tests.

Patient and public involvement

There were no patients or public involved in the design or conduct of this study.

Results

A total of 103 patients consented to participate. Ten patients were excluded because of: i) ongoing symptoms (n=3), ii) onset of symptoms in-hospital or abroad (n=2), iii) an unclear onset of symptoms (n=3), and iv) severe cognitive impairment (n=2). Table 1 shows characteristics of the 93 participants. Mean (SD) age was 65.2 (13.4) years and 55 (59.1%) were male. The median time from symptom onset to our interview at the TIA service was 4.8 (IQR 1.8 – 13.2) days.

Table 1. Patient characteristics of 93 patients suspected of TIA

Characteristics	Total (N = 93)
Mean age in years (SD)	65.2 (13.4)
Male, n (%)	55 (59.1)
Prior TIA/ischaemic stroke, n (%)	23 (24.7)
Living situation, n (%)	
Alone	25 (26.9)
With a partner	66 (71.0)
In a nursing home	2 (2.1)
Weekend onset of symptoms, n (%)	31 (33.3)
Symptoms, n (%) *	
Motor	32 (34.4)
Sensory	21 (22.6)
Visual	27 (29.0)
Speech	30 (32.3)
Median duration of neurological deficits in hours (25-75% IQR)	0.5 (0.1 – 2.4)
Diagnosis, n (%) **	
TIA or minor stroke	43 (46.2)
Probably TIA	13 (14.0)
Possibly TIA	11 (11.8)
No TIA (TIA mimic)	26 (28.0)

* Patients may have experienced more than one symptom
** In 11 patients the definite diagnosis was made by a panel consisting of three of the authors.

TIA, Transient Ischaemic Attack; IQR, interquartile range.

Patient delay

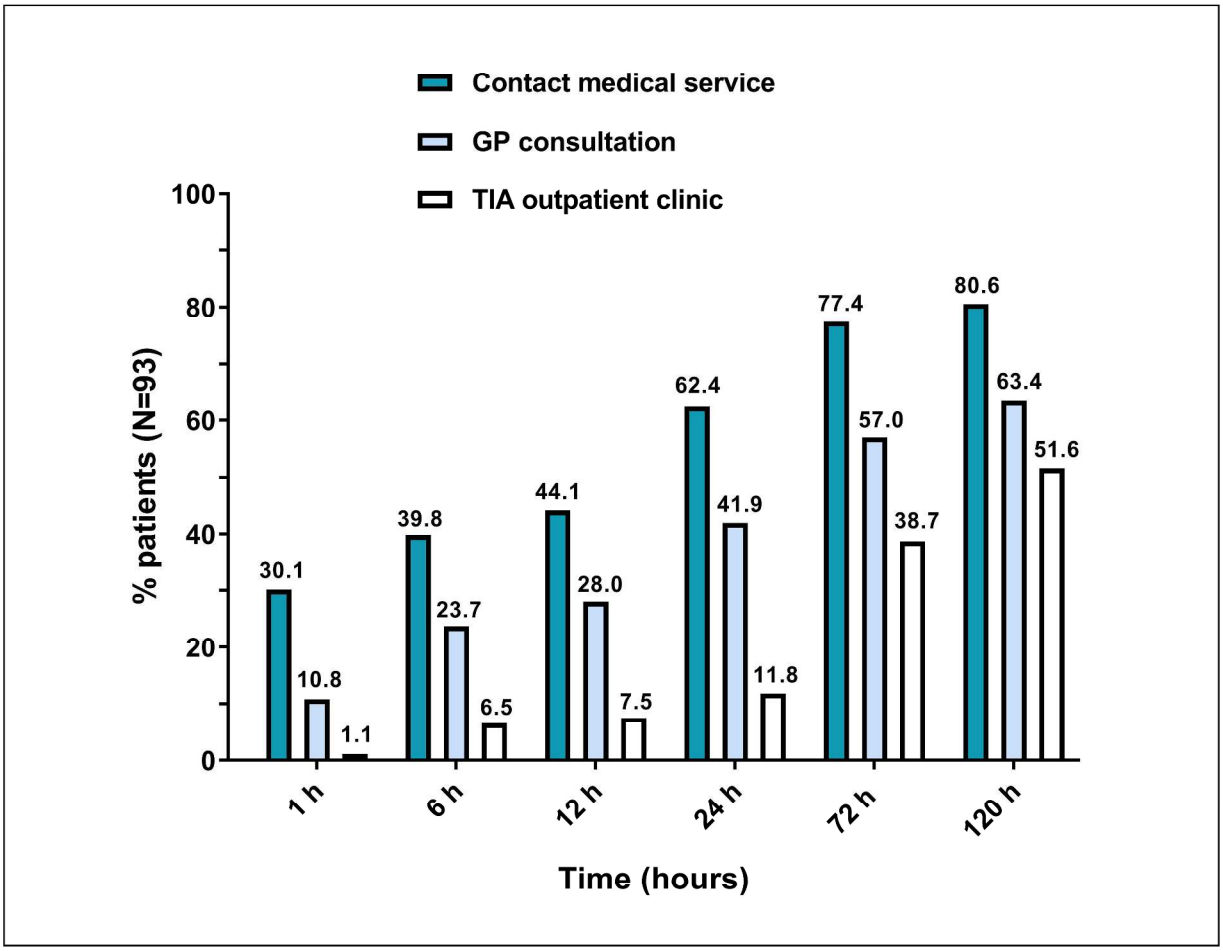
The median delay from symptoms to the first contact with a medical service was 17.5 (IQR 0.8-66.4) hours and did not differ significantly between patients with definite or probable TIA/minor stroke (19.0

(IQR 0.9-63.2) hours) and those with possible or no TIA (16.6 (IQR 0.7-92.4) hours). Thirty-six (38.7%) patients delayed seeking medical help for more than 24 hours. In 76 (81.7%) patients, the GP was the first contacted healthcare provider; in 7/76 (9.2%) during out of office hours. The emergency department or ambulance service was contacted directly by seven patients (7.5%) and ten patients (10.8%) first reported their symptoms to a medical specialist (via an outpatient clinic). In total, four (4.3%) patients had experienced similar symptoms in the previous three months, however, without contacting a health care provider.

Delays until consultation at the TIA service

Among the 76 patients who contacted the GP, the median time from onset of symptoms to the actual GP consultation was 25.5 (IQR 4.0-128.0) hours. The (median) GP delay, i.e. the time from the first contact by the patient to the GP consultation, was 2.8 (0.5-18.5) hours. The subsequent median time from GP consultation to the consultation at the TIA service was 40.8 (IQR 23.1-140.7) hours. For the complete cohort, the median time from onset of symptoms to the visit to the TIA service was 114.5 (IQR 44.0-316.6) hours. Figure 1 shows the proportions of patients that contacted a medical service, visited the GP, and visited the TIA service, at subsequent points in time from symptom onset.

Figure 1. Proportions of patients that contacted a medical service, visited the GP, and the TIA outpatient clinic, at subsequent points in time from symptom onset.



GP, general practitioner; TIA, Transient Ischaemic Attack.

Of the 62 patients who were naïve to antithrombotic medication, 27 (43.5%) received a platelet aggregation inhibitor from the GP prior to the TIA service visit. Comparing these 27 patients with the 35 patients that did not receive a platelet inhibitor, both the delay from GP to the neurologist's assessment (32.7 (22.1-94.6) vs 30.0 (22.3-141.0) hours) and the distribution of definite diagnoses (8/27 (29.6%) vs 10/35 (28.6%) diagnosed as no TIA) were similar.

Initial patient's response and perception of symptoms

Data on the initial response, perception of symptoms, and the (general) knowledge of TIA are summarised in Table 2. Fifty-four (58.1%) patients initially decided to 'wait and see'. Sixty-five patients (69.9%) did not call for medical help within the first hour after symptom onset. The main reasons for not calling were disappearance of symptoms (27/65, 42.4%), and not considering the symptoms to be threatening (15/65, 23.4%).

Thirty (32.3%) patients interpreted their symptoms as a medical emergency. Asking about initial thoughts on the possible cause of their symptoms, 65 (60.2%) did not consider a TIA. Most patients were familiar with the medical term TIA (76/93, 87.1%), but 40 (43.0%) patients had no or an incorrect idea about the symptoms related to TIA.

Table 2. Initial response, perception of symptoms, and general knowledge of TIA, in 93 patients suspected of TIA, divided in those with a certain or probably TIA/minor stroke, and in those with no or possibly TIA according to the neurologist*.

Interview item	Total (N = 93) n (%)	Certain or probable TIA/minor stroke (N = 48) n (%)**	No or possibly TIA/minor stroke (N = 34) n (%)**
Initial response to symptoms			
Initial response			
Wait and see	54 (58.1)	27 (56.3)	20 (58.8)
Direct call to health care provider	18 (19.4)	8 (16.7)	6 (17.7)
Asking a relative for advice	17 (18.3)	10 (20.8)	7 (20.6)
Other	4 (4.4)	3 (6.2)	1 (2.9)
Reasons for not seeking medical attention within 1 hour (N=65)			
Symptoms had disappeared	27 (41.5)	15 (45.5)	10 (41.7)
Symptoms not considered as **threatening**	15 (23.1)	8 (24.2)	6 (25.0)
Convinced that symptoms would **resolve spontaneously**	9 (13.8)	4 (12.1)	3 (12.5)
Because it occurred during out of office **hours**	4 (6.2)	2 (6.1)	1 (4.2)
Other	10 (15.4)	4 (12.1)	4 (16.6)
Perception of symptoms			
Interpreted as an emergency	30 (32.3)	17 (35.4)	8 (23.5)
Considered a TIA as possible cause	37 (39.8)	16 (33.3)	14 (41.2)
Experienced severity of symptoms on a scale from 0 to 10 (N=90)			
1 to 4	32 (35.6)	15 (32.6)	16 (48.5)
5 to 7	35 (38.9)	20 (43.5)	9 (27.3)
8 to 10	23 (25.5)	11 (23.9)	8 (24.2)
Knowledge of TIA			
Ever heard of a TIA	76 (87.1)	35 (72.9)	30 (88.2)
Correctly knowing key TIA symptoms	63 (57.0)	24 (50.0)	20 (58.8)
Considers rapid treatment (within 24 hrs) necessary	54 (58.1)	25 (52.1)	22 (64.7)
Knows that TIA may be a precursor of stroke	44 (47.3)	22 (45.8)	17 (50.0)

* In 11 patients a definite neurologist's diagnosis could not be retrieved from the medical files.
**No significant differences between the 'certain or probable TIA/minor stroke' patients and 'no or possible TIA' patients were found, applying Chi square tests.

TIA, Transient Ischaemic Attack.

Discussion

The majority of patients with symptoms suspected of a TIA in this outpatient population delayed seeking medical help, resulting in a delay of more than 24 hours in 38.7% of patients. Although the GP was consulted after a median of only 2.8 (0.5-18.5) hours from the first contact by the patient, it took another 40.8 (IQR 23.1-140.7) hours before the patient was seen at the TIA clinic. Only a minority (43.5%) of patients naïve to antithrombotic medication received an antiplatelet agent from the GP prior to the assessment by the neurologist.

The extent of patient delay in our study corresponds with the delay reported in previous studies from the UK, published between 2006 and 2016.[1, 3, 4, 8, 9] This means that during the last decade no clear reduction in patient delay was achieved, despite large campaigns explaining the most important stroke symptoms and stressing its urgency. As in the UK studies, we found that a majority of patients or their relatives do not respond (directly) to transient symptoms that could be caused by brain ischaemia. The

disappearance of symptoms was the main reason for delay, followed by considering the symptoms as not threatening. Even though most participants were familiar with the medical term TIA, a minority actually considered the diagnosis.

Beyond limiting the delay to a complete diagnostic assessment to identify etiological factors like atrial fibrillation or significant carotid stenosis, a crucial step forward is initiating secondary prevention with antiplatelets in the pre-hospital setting. Recent guidelines clearly recommended immediate initiation of anitplatelets in patients suspected of TIA, but our study shows there is still insufficient awareness among GPs of this requirement: only in 44% of patients with a suspected TIA antiplatelets were initiated. Unlike the UK guidelines that recommend GPs to start such treatment in any suspected TIA patient, the Dutch guidelines recommend GPs to start only if assessment by the neurologist is not feasible the same day. We consider a clear-cut recommendation to start an antiplatelet in any suspected TIA patient (naïve to antithrombotics) as the best option.

One of the strengths of our study is that we were able to provide precise estimates of the different components of pre-hospital delay. Moreover, we interviewed not only those with definite TIA, but the larger domain of suspected TIA cases, importantly, before the definite diagnosis was established. Therefore, without bias caused by knowledge of the diagnosis. A limitation was that in 11.8% of cases presence or absence of TIA was determined in consensus by a panel based only on history taking, that is without the conclusion of the consulting neurologist.

Conclusion

Current patient and physician delay in suspected TIA is considerable. Our results emphasise the need for both patient and physician education, aimed at quick consultation at a TIA outpatient clinic and an early start of secondary prevention by GPs in any case of a suspected TIA.

Contributors

LD is PhD candidate and the primary researcher. LD and FH drafted the manuscript. All authors have been involved in revising it critically, and approved the final manuscript.

Funding

None.

Competing interests

None declared.

Patient consent

No written informed consent procedure required. Data were collected with immediate de-identification at the patient interview.

Ethics Approval

This study was approved by the Medical Research Ethics Committee of the University Medical Center of Utrecht, the Netherlands. Formal ethical approval was not required.

Data sharing statement

No additional data available.

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Delay in patients suspected of transient ischaemic attack: a cross-sectional study

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Delay in patients suspected of transient ischaemic attack: a cross-sectional study

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Abstract

Objectives

Suspected Transient Ischaemic Attack (TIA) necessitates an urgent neurological consultation and a rapid start of antiplatelet therapy to reduce the risk of early ischaemic stroke following a TIA. Guidelines for general practitioners (GPs) emphasise the urgency to install preventive treatment as soon as possible. We aimed to give a contemporary overview of both patient and physician delay.

Methods

A survey at two rapid-access TIA outpatient clinics in Utrecht, The Netherlands. All patients suspected of TIA were interviewed to assess time delay to diagnosis and treatment, including the time from symptom onset to i) the first contact with a medical service (patient delay), ii) consultation of the GP and iii) assessment at the TIA outpatient clinic. We used the diagnosis of the consulting neurologist as reference.

Results

Of 93 included patients, 43 (46.2%) received a definite, 13 (14.0%) a probable, 11 (11.8%) a possible and 26 (28.0%) no diagnosis of TIA. The median time from symptom onset to the visit to the TIA service was 114.5 (IQR 44.0-316.6) hours. Median patient delay was 17.5 (IQR 0.8-66.4) hours, with a delay of more than 24 hours in 36 (38.7%) patients. The GP was first contacted in 76 (81.7%) patients, and median time from first contact with the GP practice to the actual GP consultation was 2.8 (0.5-18.5) hours. Median time from GP consultation to TIA service visit was 40.8 (IQR 23.1-140.7) hours. Of the 62 patients naïve to antithrombotic medication who consulted their GP, 27 (43.5%) received antiplatelet therapy.

Conclusions

There is substantial patient and physician delay in the process of getting a confirmed TIA diagnosis, resulting in suboptimal prevention of an early ischemic stroke.

Key words: TIA, minor stroke, patient delay, physician delay

Strengths and limitations of this study

- We interviewed patients suspected of TIA before the definite diagnosis was established, thus without bias caused by knowledge of the final diagnosis.
- We were able to provide precise estimates of the different components of the total pre-hospital delay time.
- We also assessed whether antiplatelet therapy was initiated prior to the neurologist's assessment.
- In 11 of 93 cases we used an expert panel to determine the diagnosis of TIA, in absence of a conclusion of the consulting neurologist.
- Our cohort is relatively small, but large enough to provide these estimates of current time delay in patients suspected of TIA.

Introduction

A Transient Ischaemic Attack (TIA) is a medical emergency, as the risk of a subsequent ischaemic stroke following a TIA is highest in the early stage. Urgent neurological consultation followed by proper stroke preventive treatment reduces this risk substantially, with the rapid start of an antiplatelet agent as key intervention.[1, 2]

Previous studies indicated that around 30 to 40% of patients with TIA delay contacting a medical service for more than 24 hours.[1, 3, 4, 5] Over the past decade, patient awareness campaigns like 'ACT FAST' aimed for better recognition of and a quick response to symptoms suspected of stroke to enable thrombolysis or invasive treatment within the first hours.[6] Although TIA is part of the acute ischaemic brain spectrum, it is uncertain whether campaigns like this also positively affect acting upon symptoms that are transient, typically short-lasting and often less distinct. A before and after evaluation of the 'ACT FAST' showed an improvement of patient delay in stroke patients, but in patients with a TIA or minor stroke there was no improvement in use of emergency medical services or time to first seeking medical attention within 24 hours [7].

The EXPRESS study (2007) laid the foundation for a drastic decrease of physician delay to diagnosis and treatment of TIA, i) by the development of rapid-access TIA services, and ii) guidelines for general practitioners (GPs).[1, 8] The Dutch GP guidelines recommend GPs to refer all patients suspected of TIA to a TIA service within 24 hours, and to immediately initiate a platelet aggregation inhibitor, unless it is certain that the patient will be examined by a neurologist on the same day.[9] The UK GP guidelines emphasise an immediate start of medication by the GP in any suspected TIA patient, and have recommended the use of the prognostic ABCD2 score (Age, Blood pressure, Clinical features, Duration, Diabetes) to define high-risk patients that have to be examined by the neurologist within 24 hours.[10] However, in the latest update of the UK national clinical guideline for stroke in 2016 the use of the ABCD2 score was abandoned, since new studies showed that the ABCD2 is an inaccurate predictor of early stroke.[11, 12, 13] This guideline now also recommends to refer all suspected TIA patients to a TIA service within 24 hours.

We aimed to assess current patient and physician delay from onset of suspected TIA symptoms to specialist consultation.

Methods

We conducted a survey among patients suspected of TIA who were referred to one of two participating rapid-access TIA services in the city of Utrecht, The Netherlands. Availability of TIA services in the Netherlands is restricted to weekdays. During 6 months in the period 2013-2014, consecutive patients were asked to participate when arriving at the TIA service. Patients were excluded in the case of: (1) ongoing symptoms; (2) onset of symptoms in-hospital or outside the Netherlands; (3) severe cognitive impairment; (4) inability to clarify the time of onset of symptoms.

Participants suspected of TIA were interviewed at the start of their day at the TIA service before knowing their final diagnosis. We collected information about the following items in a standardized questionnaire (included as a supplementary file): (1) the interval from onset of symptoms to the patient's first contact with a medical service (patient delay), the interval to the GP visit, and the interval to the TIA service visit; (2) the initiation of an antiplatelet agent; (3) the type and duration of symptoms; (4) the initial reaction of the patient (what did the patient do?); (5) the initial perception (what did the patient think?); (6) general knowledge of TIA. Responses were written down by the interviewer. In case a patient had experienced multiple recent (suspected) TIAs, we evaluated the last event.

We considered the consulting neurologist's diagnosis of TIA as reference. Diagnoses were categorised as definite TIA or minor stroke, probable TIA, possible TIA, or no TIA. In 11 cases (11.8%) the neurologist's conclusion was unclear or absent, and three clinicians (LSD,LJK, FHR) decided in a consensus meeting on the diagnosis.

In this observational study, with estimations of delay, a method for sample size calculation is lacking. We therefore included a convenient number of participants.

Delay is presented as median with 25-75% interquartile range (IQR). We used Mann-Whitney U tests for comparing delay across subgroups. In an overview of results per interview item, we additionally compared results between those with a definite or probable TIA (or minor stroke), and those with no or a possible TIA, applying Chi square tests.

Patient and public involvement

There were no patients or public involved in the design or conduct of this study.

Results

A total of 103 patients consented to participate. Ten patients were excluded because of: i) ongoing symptoms (n=3), ii) onset of symptoms in-hospital or abroad (n=2), iii) an unclear onset of symptoms (n=3), and iv) severe cognitive impairment (n=2). Table 1 shows characteristics of the 93 participants. Mean (SD) age was 65.2 (13.4) years and 55 (59.1%) were male. The median time from symptom onset to our interview at the TIA service was 4.8 (IQR 1.8 – 13.2) days. Table 2 shows an overview of the different parts of time delay to the assessment at the TIA service.

Table 1. Patient characteristics of 93 patients suspected of TIA

Characteristics	Total (N = 93)
Mean age in years (SD)	65.2 (13.4)
Male, n (%)	55 (59.1)
Prior TIA/ischaemic stroke, n (%)	23 (24.7)
Living situation, n (%)	
Alone	25 (26.9)
With a partner	66 (71.0)
In a nursing home	2 (2.1)
Weekend onset of symptoms, n (%)	31 (33.3)
Symptoms, n (%) *	
Motor	32 (34.4)
Sensory	21 (22.6)
Visual	27 (29.0)
Speech	30 (32.3)
Median duration of neurological deficits in hours (25-75% IQR)	0.5 (0.1 – 2.4)
Diagnosis, n (%) **	
TIA or minor stroke	43 (46.2)
Probably TIA	13 (14.0)
Possibly TIA	11 (11.8)
No TIA (TIA mimic)	26 (28.0)

* Patients may have experienced more than one symptom

** In 11 patients the definite diagnosis was made by a panel consisting of three of the authors.

TIA, Transient Ischaemic Attack; IQR, interquartile range.

Table 2. Delay for the 93 patients suspected of a TIA.

Type of delay time	Median time (IQR), hours
Patient delay	
Time from symptom onset to first contact with medical service	17.5 (IQR 0.8-66.4)

▪ Onset during weekdays (N=31) Onset during weekend (N=62)	8.8 (IQR 0.5-103.5) 21.0 (IQR 13.0-65.3)	p=0.29
▪ Prior TIA or stroke No prior TIA or stroke	3.0 (IQR 0.8-40.5) 19.0 (IQR 1.0-67.5)	p=0.29
GP delay Time from contact with GP to actual GP consultation (N=76)	2.8 (0.5-18.5)	
▪ GP during office hours (N=69) GP out of hours service (N=7)	3.0 (0.5-9.5) 1.4 (0.4-7.8)	p=0.34
Referral delay Time from GP consultation to assessment at TIA service (N=76)	40.8 (IQR 23.1-140.7)	
▪ GP during office hours (N=69) GP out of hours service (N=7)	30.5 (IQR 23.2-141.3) 58.4 (IQR 13.7-96.4)	p=0.62
▪ History of TIA/ stroke No history of TIA/stroke	105.0 (IQR 27.3-228.8) 30.0 (IQR 22.5-98.5)	p=0.09
Total delay Time from symptom onset to assessment at TIA service	114.5 (IQR 44.0-316.6)	

IQR, interquartile range; TIA, transient ischaemic attack; GP, general practitioner.

Patient delay

The median delay from symptoms to the first contact with a medical service was 17.5 (IQR 0.8-66.4) hours and did not differ significantly between patients with definite or probable TIA/minor stroke (19.0 (IQR 0.9-63.2) hours) and those with possible or no TIA (16.6 (IQR 0.7-92.4) hours). Thirty-six (38.7%) patients delayed seeking medical help for more than 24 hours. In 76 (81.7%) patients, the GP was the first contacted healthcare provider; in 7/76 (9.2%) during out of office hours. The emergency department or ambulance service was contacted directly by seven patients (7.5%) and ten patients (10.8%) first reported their symptoms to a medical specialist (other than a neurologist) via an outpatient clinic. In total, four (4.3%) patients had experienced similar symptoms in the previous three months, however, without contacting a health care provider.

In the 31 (33,3%) patients with symptom initiation during the weekend patient delay was 21.0 (IQR 13.0-65.3) hours, and 8.8 (IQR 0.5-103.5) hours in those with symptoms during weekdays (p=0.29). Patients who had had a prior TIA or stroke (n=23, 24.7%) contacted the GP in 78.3% of cases (during office hours, n=17; GP out of hours service, n=1), and the median delay to first contact was 3.0 (IQR 0.8-40.5) hours, which was lower than in those without prior TIA/stroke; 19.0 (IQR 1.0-67.5) hours, p=0.29.

Delays until consultation at the TIA service

Among the 76 patients who contacted the GP, the median time from onset of symptoms to the actual GP consultation was 25.5 (IQR 4.0-128.0) hours. The (median) GP delay, i.e. the time from the first contact by the patient with the GP practice to the actual GP consultation, was 2.8 (0.5-18.5) hours. The subsequent median time from GP consultation to the consultation at the TIA service (referral delay) was 40.8 (IQR 23.1-140.7) hours.

In the patients who consulted their own GP during office hours (n=69), referral delay was 30.5 (IQR 23.2-141.3); in the patients who (first) consulted a GP out of hours service (n=7) this was 58.4 (IQR 13.7-96.4) hours (p=0.62). The referral delay was 105.0 (IQR 27.3-228.8) hours in the 23 (24.7%) patients who had a prior TIA or stroke, and 30.0 (IQR 22.5-98.5) in those without prior TIA/stroke (p=0.09).

For the complete cohort, the median time from onset of symptoms to the visit to the TIA service was 114.5 (IQR 44.0-316.6) hours. Figure 1 shows the proportions of patients that contacted a medical service, visited the GP, and visited the TIA service, at subsequent points in time from symptom onset.

Of the 62 patients who were naïve to antithrombotic medication, 27 (43.5%) received a platelet aggregation inhibitor from the GP prior to the TIA service visit. Comparing these 27 patients with the 35 patients that did not receive a platelet inhibitor, both the delay from GP to the neurologist's assessment (32.7 (22.1-94.6) vs 30.0 (22.3-141.0) hours) and the distribution of definite diagnoses (8/27 (29.6%) vs 10/35 (28.6%) diagnosed as no TIA) were similar.

Initial patient's response and perception of symptoms

Data on the initial response, perception of symptoms, and the (general) knowledge of TIA are summarised in Table 3. Fifty-four (58.1%) patients initially decided to 'wait and see'. Sixty-five patients (69.9%) did not call for medical help within the first hour after symptom onset. The main reasons for not calling were disappearance of symptoms (27/65, 42.4%), and not considering the symptoms to be threatening (15/65, 23.4%).

Thirty (32.3%) patients interpreted their symptoms as a medical emergency. Asking about initial thoughts on the possible cause of their symptoms, 65 (60.2%) did not consider a TIA. Most patients were familiar with the medical term TIA (76/93, 87.1%), but 40 (43.0%) patients had no or an incorrect idea about the symptoms related to TIA.

Table 3. Initial response, perception of symptoms, and general knowledge of TIA, in 93 patients suspected of TIA, divided in those with a certain or probably TIA/minor stroke, and in those with no or possibly TIA according to the neurologist*.

Interview item	Total (N = 93)	Certain or probable TIA/minor stroke (N = 48)	No or possibly TIA/minor stroke (N = 34)
	n (%)	n (%)**	n (%)**
Initial response to symptoms			
Initial response			

Wait and see	54 (58.1)	27 (56.3)	20 (58.8)
Direct call to health care provider	18 (19.4)	8 (16.7)	6 (17.7)
Asking a relative for advice	17 (18.3)	10 (20.8)	7 (20.6)
Other	4 (4.4)	3 (6.2)	1 (2.9)
Reasons for not seeking medical attention within 1 hour (N=65)			
Symptoms had disappeared	27 (41.5)	15 (45.5)	10 (41.7)
Symptoms not considered as threatening	15 (23.1)	8 (24.2)	6 (25.0)
Convinced that symptoms would resolve spontaneously	9 (13.8)	4 (12.1)	3 (12.5)
Because it occurred during out of office hours	4 (6.2)	2 (6.1)	1 (4.2)
Other	10 (15.4)	4 (12.1)	4 (16.6)
Perception of symptoms			
Interpreted as an emergency	30 (32.3)	17 (35.4)	8 (23.5)
Considered a TIA as possible cause	37 (39.8)	16 (33.3)	14 (41.2)
Experienced severity of symptoms on a scale from 0 to 10 (N=90)			
1 to 4	32 (35.6)	15 (32.6)	16 (48.5)
5 to 7	35 (38.9)	20 (43.5)	9 (27.3)
8 to 10	23 (25.5)	11 (23.9)	8 (24.2)
Knowledge of TIA			
Ever heard of a TIA	76 (87.1)	35 (72.9)	30 (88.2)
Correctly knowing key TIA symptoms	63 (57.0)	24 (50.0)	20 (58.8)
Considers rapid treatment (within 24 hrs) necessary	54 (58.1)	25 (52.1)	22 (64.7)
Knows that TIA may be a precursor of stroke	44 (47.3)	22 (45.8)	17 (50.0)

* In 11 patients a definite neurologist's diagnosis could not be retrieved from the medical files.
**No significant differences between the 'certain or probable TIA/minor stroke' patients and 'no or possible TIA' patients were found, applying Chi square tests.

TIA, Transient Ischaemic Attack.

Discussion

The majority of patients with symptoms suspected of a TIA in this outpatient population delayed seeking medical help, resulting in a delay of more than 24 hours in 38.7% of patients (median 17.5 (IQR 0.8-66.4)). Although the actual GP consultation took place after a median of only 2.8 (0.5-18.5) hours from the first contact with the GP practice (GP delay), it took another 40.8 (IQR 23.1-140.7) hours before the patient was seen at the TIA clinic (referral delay). Only a minority (43.5%) of patients naïve to antithrombotic medication received an antiplatelet agent from the GP prior to the assessment by the neurologist.

The extent of patient delay in our study corresponds with the delay reported in previous studies from the UK, published between 2006 and 2016.[1, 3-5, 14, 15] Both the Dutch and British health care system have a strong primary care system and rapid-access TIA services. In the Netherlands there have been campaigns promoting recognition of stroke symptoms similar to the UK 'ACT FAST' campaign. Our results indicate that during the last decade no clear reduction in patient delay was achieved, despite these campaigns explaining the most important stroke symptoms and stressing its urgency. As in the UK studies, we found that a majority of patients or their relatives do not respond (directly) to transient symptoms that could be caused by brain ischaemia. The disappearance of symptoms was the main reason for delay, followed by considering the symptoms as not threatening. Even though most participants were familiar with the medical term TIA, a minority actually considered the diagnosis.

Given the time from symptom onset to the visit of the rapid-access TIA service it can be concluded that there is room for improvement of the current Dutch system of TIA management. In everyday practice the guidelines' recommendation of an assessment by the neurologist at a rapid-access TIA service the same or next day is not met. The strong gatekeeper's function of the GPs in the Dutch healthcare system has beneficial effects on selection of referral and health budgets, however, it may also cause undesirable delays in those who actually had a TIA.

Beyond limiting the delay to a complete diagnostic assessment to identify etiological factors like atrial fibrillation or significant carotid stenosis, probably the most crucial step forward is initiating secondary prevention with antiplatelets in the pre-hospital setting. Recent guidelines clearly recommended immediate initiation of antiplatelets in patients suspected of TIA, but our study shows there is still insufficient awareness among GPs of this requirement: only in 44% of patients with a suspected TIA antiplatelets were initiated. Unlike the UK guidelines that recommend GPs to start such treatment in any suspected TIA patient, the Dutch guidelines recommend GPs to start only if assessment by the neurologist is not feasible the same day. We consider a clear-cut recommendation to start an antiplatelet in any suspected TIA patient (naïve to antithrombotics) as the best option.

If all GPs would follow the recommendation on antiplatelet therapy, the delay time to treatment would only be 2.8 (0.5-18.5) hours. We therefore consider enforcing this recommendation more important

than the recommendation on assessment by the neurologist within 24 hours. Our results help to convince GPs that more timely action is needed in patients suspected of TIA.

An alternative care system would be the 'French' model with (i) a 24/7 TIA rapid-access service and (ii) public campaigns raising awareness among lay people that every acute neurological deficit should be considered a medical emergency similarly to acute chest pain, also requiring ambulance transportation, certainly if symptoms persist (possibly stroke). However, this would mean a large shift in the organisation of health care in the Netherlands, a large increase in health care costs.

One of the strengths of our study is that we were able to provide precise estimates of the different components of pre-hospital delay. Moreover, we interviewed not only those with definite TIA, but the larger domain of suspected TIA cases, importantly, before the definite diagnosis was established and without bias caused by this knowledge. Recall errors still need to be considered. A limitation was that in 11.8% of cases presence or absence of TIA was determined in consensus by a panel based only on history taking, that is without the conclusion of the consulting neurologist.

Our study indicates that there is still a need for both patient and physician education regarding the required urgency in case of a suspected TIA. Lay people need to be better informed that also mild stroke-like symptoms that quickly disappear have to be reported to a physician as soon as possible. GPs should be better educated about the rationale for an early start of antiplatelet therapy and that they can safely install this medication. Furthermore, neurologists should advocate the early start of treatment during their contacts with GPs. Further research is needed to explore the main determinants of patient delay and the main reasons for the lack of prescribing antiplatelet therapy by GPs.

Conclusion

Current patient and physician delay in suspected TIA is considerable. Our results emphasise the need for both patient and physician education, aimed at quick consultation at a TIA outpatient clinic and an early start of secondary prevention by GPs in any case of a suspected TIA.

Contributors

LD is PhD candidate and the primary researcher. LD and FR drafted the manuscript. MB, LK and AW have revised it critically, and all authors approved the final manuscript.

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The primary researcher (drs. L.S. Dolmans) performed this study as a general practitioner in training, and combined his training with a PhD track. 'Stichting Beroepsopleiding Huisartsen (SBOH)', employee of Dutch GP trainees (financially) supported the PhD track.

Competing interests

None declared.

Patient consent

No written informed consent procedure required. Data were collected with immediate de-identification at the patient interview.

Ethics Approval

This study was approved by the Medical Research Ethics Committee of the University Medical Center of Utrecht, the Netherlands. Formal ethical approval was not required and the committee waived the requirement to obtain formal informed consent. All participants gave their oral consent.

Data sharing statement

No additional data available.

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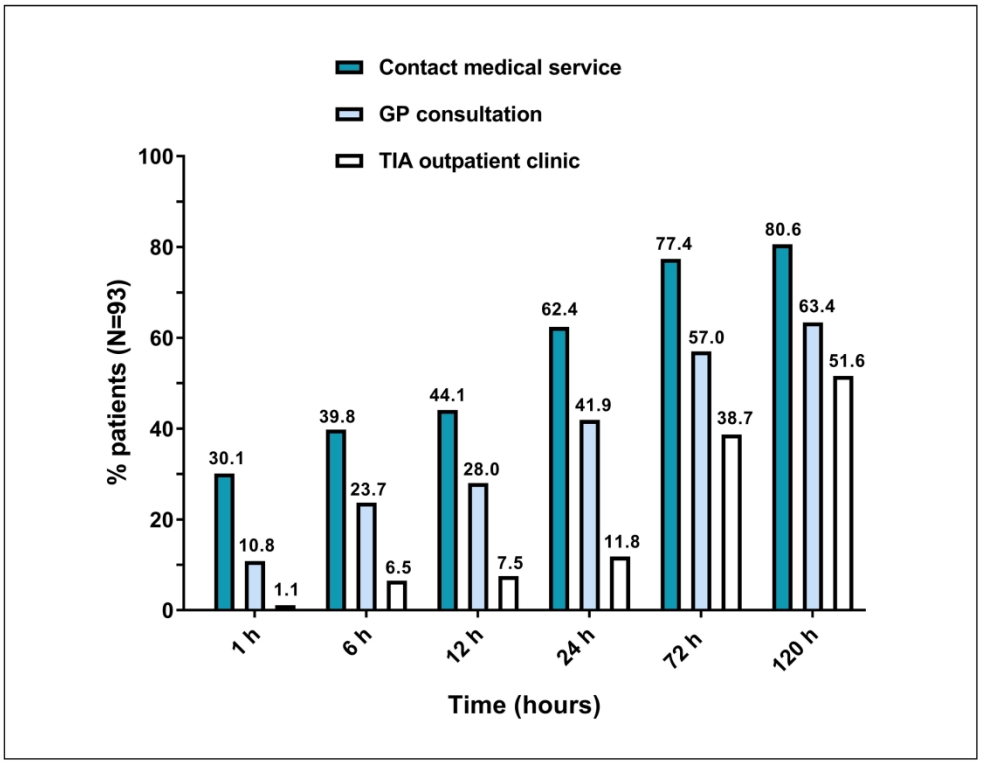
Figure legend:

Caption: Figure 1. Proportions of patients that contacted a medical service, visited the GP, and the TIA outpatient clinic, at subsequent points in time from symptom onset.

Legend: GP, general practitioner; TIA, Transient Ischaemic Attack.



Caption : Figure 1. Proportions of patients that contacted a medical service, visited the GP, and the TIA outpatient clinic, at subsequent points in time from symptom onset.Legend below: GP, general practitioner; TIA, Transient Ischaemic Attack.

120x111mm (600 x 600 DPI)

Questionnaire – Delay in patients suspected of TIA

-Translated from Dutch-

Time points for determining delay

1	When did the symptoms start? Date __-__-__ time __.__ h
2	Who did you tell first about the symptoms? a. Relative or friend b. Relative or friend with medical knowledge c. Medical institution i. General practice ii. GP out of hours service iii. Emergency department iv. Ambulance service v. Other This was at: date __-__-__ time __.__ h
3	If question 2 was answered with a or b: Your first contact with a medical service was with? a. General practice b. GP out of hours service c. Emergency department d. Ambulance service e. Other This was at: date __-__-__ time __.__ h
4	The moment you made an appointment with the GP was at? Date __-__-__ time __.__ h
5	The GP consultation was at? Date __-__-__ time __.__ h
6	The TIA outpatient clinic visit was at? Date __-__-__ time __.__ h

Clinical characteristics, knowledge, interpretation and response to symptoms

1	*Patient characteristics* a. Age: ___ years b. Sex: male / female c. History of TIA or stroke? i. Yes ii. No d. Living situation i. Alone ii. With a partner or relatives iii. Nursing or care home e. Highest level of education? (*the original version includes Dutch levels of education*) i. Primary education ii. Lower secondary education iii. Upper secondary education iv. Post-secondary non-tertiary education v. Tertiary education vi. Other, namely: _____
2	*Knowledge of TIA before the event* Were you familiar with TIA before this episode? a. No b. Yes i. What are signs or symptoms of a TIA? 1. No idea 2. The following: _____ _____ _____ ii. A TIA can be a precursor of a certain disease. What disease? 1. No idea 2. Precursor of: _____ Did you think a TIA requires urgent medical assessment? a. Yes b. No c. Does not know
3	*Symptoms experienced* a. Type of symptoms? Was/where there: i. Paresis, weakness of: 1. Face 2. Arm/hand 3. Leg/foot

Left/right

ii. Numbness/paresthesia of:
    1. Face
    2. Arm/hand
    3. Leg/foot

    Left/right

iii. Visual impairment/symptoms:
    1. Diplopia
    2. Blurry vision (both eyes)
    3. Blindness/loss of vision in a part of visual field (both eyes)
    4. Blindness/loss of vision in one eye

iv. Communication problem:
    1. Impairment of speech or comprehension of language (dyphasia)
    2. Slurred speech, problems with articulation/pronunciation (dysarthria)

v. Loss of consciousness

Duration of symptoms? ___ hours and ___ min

Can you fully remember what happened?
i. Yes
ii. No

b. Did you consider these symptoms to be an emergency?
    i. Yes
    ii. No
c. How severe did you consider these symptoms were?
    i. 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10
d. What was your first response to symptoms?
    i. Nothing specific because symptoms quickly resolved
    ii. Wait and see
    iii. I asked a relative or friend for advice
    Advice: _____
    iv. Self-treatment
    v. Seeking medical attention
    vi. Other: _____
e. Did you have an idea what caused the symptoms?
    i. No
    ii. Yes, namely: _____
f. What was the situation at that time?
    i. Alone
    ii. In company of: _____
    Did your bystanders considered the event an emergency?
        1. Yes
        2. No

	g. Did you contact a medical service within one hour? i. Yes ii. No, because: 1. Symptoms resolved 2. Thought that the symptoms would resolve 3. Did not consider it severe enough 4. Others said it could wait 5. Unable because of the symptoms 6. Transportation issues 7. It happened during outside office hours 8. Other, namely: _____
4	*Treatment by the GP, if applicable* a. Did the GP start any medication? iii. No iv. Yes, namely: 1. Aspirin 2. Dipyridamole 3. Anticoagulant 4. Statin 5. Antihypertensives 6. Other, namely: _____ b. If not, did you already use antithrombotic, or cardiovascular medication? i. No ii. Yes, namely: 1. Aspirin 2. Dipyridamole 3. Anticoagulant 4. Statin 5. Antihypertensives 6. Other, namely: _____ 7. Does not know

GP, general practitioner.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract ✓ *Page* 0/1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found ✓ *Page 1*
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported ✓ *Page 3*
Objectives	3	State specific objectives, including any prespecified hypotheses ✓ *Page 3*
Methods		
Study design	4	Present key elements of study design early in the paper ✓ *Page 4*
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection ✓ *Page 4*
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants ✓ *Page 4*
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable ✓ *Page 4*
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group ✓ *Page 4/questionnaire as supplementary file*
Bias	9	Describe any efforts to address potential sources of bias ✓ *Page 4*
Study size	10	Explain how the study size was arrived at ✓ *Page 4*
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why ✓ *Page 4*
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses ✓ *Page 4*
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage

		(c) Consider use of a flow diagram ✓ *Page 5*
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest *(n.a)* ✓ *Page 5*
Outcome data	15*	Report numbers of outcome events or summary measures ✓ *Page 5/6*
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period ✓ *Page 5-7*
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses ✓ *Page 8/9*
Discussion		
Key results	18	Summarise key results with reference to study objectives ✓ *Page 10*
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias ✓ *Page 11*
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence ✓ *Page 10/11*
Generalisability	21	Discuss the generalisability (external validity) of the study results ✓ *Page 10/11*
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based ✓ *Page 11*

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.