



**Varying uses of the ABCD2 scoring system in primary and secondary care: a qualitative study**

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**Title:**

**Varying uses of the ABCD2 scoring system in primary and secondary care: a qualitative study**

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24 quotes are anonymised and information used in reports could not lead to identification.  
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29 **ABSTRACT**

30 **Objectives:** To explore the usage of the ABCD2 risk stratification score by general  
31 practitioners and hospital staff during the referral of patients with suspected transient  
32 ischaemic attack (TIA) or minor stroke.  
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35 **Design:** Qualitative study using semi-structured interviews.

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37 **Setting:** Nine general practices and two hospital sites in England (Birmingham and  
38 Cambridge).  
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41 **Participants:** Nine general practitioners, nine hospital staff (two consultants, four nurses,  
42 two ultrasonographers and one administrator) and 12 patients with recently suspected  
43 transient ischaemic attack or minor stroke (within the previous three months).  
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46 **Results:** In both sites, clinicians used a referral proforma based around the ABCD2  
47 scoring system for a range of purposes including self-education, to assist emphasising  
48 urgency to the patient, as a referral pathway facilitator and as a diagnostic tool. Negative  
49 views of its role included potential medico-legal threat, that it was a barrier to appropriate  
50 care, and led to mis-diagnosis. Despite having differing uses by different clinicians, the  
51 ABCD2 proforma was the central means of inter-professional communication in TIA  
52 referrals across both sites. No patients were aware of their ABCD2 score.  
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4 **Conclusions:** Understanding how prediction rules are used in practice is key to  
5 determining their impact on processes of care and clinical outcomes. In practice, GPs and  
6 their colleagues use the ABCD2 score in subtly different ways and it functions as a  
7 “boundary object” by both accommodating these multiple purposes, yet still successfully  
8 aiding communication between them.  
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## Introduction

The ABCD2 score is a clinical prediction rule developed in 2007 to predict the risk of recurrent stroke soon after transient ischaemic attack (TIA).<sup>1</sup> The score has rapidly become an integral part of the referral process for TIA internationally<sup>2-6</sup> and often forms part of a “proforma” – a form which integrates standardised protocols and frequently clinical prediction rules – for referrals to secondary care. Such proformas are increasingly common for primary to secondary care communication: in April 2011 Addenbrookes Hospital in Cambridge, UK, requested the use of a proforma for 48 conditions ranging from early inflammatory arthritis to suspected renal colic.

Despite the increasing use of proformas, there is only limited research into their use or impact.<sup>7</sup> For example, the ABCD2 score was derived and validated in secondary care as a prognostic score, yet the UK’s National Institute for Health and Clinical Excellence (NICE) recommends its use in all referrals of suspected TIA by General Practitioners (GPs) and accident and emergency (A&E) departments<sup>2</sup> despite evidence of substantial disagreement between specialist and generalist scores.<sup>8,9</sup> We studied the ABCD2 score’s use across different parts of the health service in order to analyse how the score and its associated proforma are used in everyday clinical practice.

### Box 1: Description of the ABCD2 clinical prediction rule for stroke risk after TIA

Age $\geq$ 60	1 point
Blood Pressure $\geq$ 140/90 mmHg at acute evaluation	1 point
Clinical features	1 point for speech disturbance without weakness; 2 points for unilateral weakness
Duration	1 point for 10-59 minutes, 2 points for $\geq$ 60 minutes
Diabetes	1 point
Patients scoring 4 or more points are deemed high risk. <sup>2</sup>	

Our theoretical background comes from an area of social science research that looks at the increasing role of forms and other systems of standardisation in medical practice. Although protocols are frequently criticised because they constrain and dictate practice,

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3 rendering individual decision-making redundant, Timmermans and Berg argue that this  
4 criticism is misplaced.<sup>10</sup> Rather, an inherent aspect of any useful protocol is that it can  
5 accommodate local deviation. Individuals invariably ‘tinker’ with them, whilst ensuring  
6 they are not undermined, such that they are workable for each specific circumstance. As a  
7 result, a protocol often becomes what has been termed a ‘boundary object’<sup>11</sup>. This term  
8 refers to any item or procedure that is sufficiently standardised to ensure a common  
9 meaning or action is established across different specialist fields, yet also is sufficiently  
10 flexible to allow for adaptation to make it useful and meaningful in local contexts. As a  
11 result, though there may well be significant differences between various locations or  
12 areas of expertise, boundary objects serve to provide common ground, and are thus a way  
13 of establishing overall coherence and integration.  
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## 24 **Methods**

### 25 **Participants and procedures**

26 This study was a prelude to a randomised controlled trial of a novel method for stroke  
27 prevention in primary care. Participants were recruited from two locations  
28 (Cambridgeshire/Addenbrookes hospital and West Midlands/Queen Elizabeth hospital) to  
29 permit exploration of variation between sites. The TIA clinics in both areas had  
30 independently created proformas which they requested be completed for all referrals, in  
31 which the ABCD2 score was central.  
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40 Eligible GPs had to be within the catchment area of Addenbrooke’s or Queen Elizabeth  
41 hospital TIA clinic while staff members included any within these hospitals who  
42 regularly encountered patients with suspected TIA. GPs were approached using the  
43 mailing lists of local research networks (these GPs had an obligation and/or interest in  
44 participating in research generally, rather than being stroke research enthusiasts) and all  
45 nine volunteers with whom we could arrange interviews were interviewed. We identified  
46 our sample of secondary care informants by adopting a “cascade method” based on  
47 discussing in depth with each interviewee with whom they had significantly liaised. As a  
48 result we identified a cross section of staff we might otherwise have missed: in total we  
49 interviewed six Cambridgeshire GPs and three Birmingham GPs; two stroke consultants;  
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3 three stroke nurses; two ultrasonographers involved in assessing TIA patients; one stroke  
4 team administrator and one A&E triaging nurse. Five of the hospital staff came from  
5 Queen Elizabeth Hospital and four from Addenbrookes, with an equal number of doctors  
6 (one) and nurses (two) from each site.  
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12 In addition, twelve patients were interviewed in their homes within 3 months of being  
13 seen in the Addenbrookes or Queen Elizabeth hospital clinic with a suspected TIA. Of  
14 these, seven had had a TIA or minor stroke diagnosis confirmed.  
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### 18 19 20 21 **Interviews**

22 Face-to-face interviews followed a topic guide generated by the research team that was  
23 initially piloted. The focus was not specifically on the ABCD2 form, but rather to  
24 establish a qualitative understanding of experiences along the pathway from GP  
25 consultation to TIA clinic referral, inviting professionals to draw on past cases they had  
26 referred or been referred. A set of interviews with patients was also conducted; these  
27 form a very limited part of our analysis here as in all twelve cases they were unaware of  
28 the ABCD2 score or its role in their referral. Interviews lasted on average one hour. They  
29 were audio-recorded and then transcribed verbatim by a professional transcription  
30 service. DE, NM (both GPs), SC (medical anthropologist), and SV (qualitative  
31 researcher) conducted the interviews at the hospital site (hospital staff members), at the  
32 GP's practice (GPs) or at the patient's home. The interviewer checked the full  
33 transcription against the audio-recording for accuracy.  
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### 45 46 **Analysis**

47 DE, SC and NM read through the transcripts and established central themes that were  
48 raised. An initial sample of transcripts was coded independently by DE and SC (using  
49 NVivo) to ensure reliability and to revise codes where necessary. Subsequent themes that  
50 emerged as these were applied to the remaining transcripts were always discussed within  
51 the team, and if adopted, coded across the entire dataset.  
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It was clear that much discussion regarding suspected TIAs - when it was appropriate to refer, whether they should be considered urgent cases, and possible patient pathways that could be followed - centred on the current use of the ABCD2 proforma. This was therefore identified as a pivotal issue that would serve to capture many of the more general comments made, and provide a specific focus to explore how a suspected TIA is negotiated in referral pathways. As a result, DE and SC undertook further analysis of the transcripts; any direct or indirect mention of the ABCD2 scoring system, or practical use of a proforma in the referral pathway, was consequently noted in every transcript in a thematic analysis. Further coding allowed a detailed typology of varying roles associated with the ABCD2 score and the proforma itself (if used); this included both positive and negative features of its use.

## Results

Nine GPs, twelve patients, and nine hospital staff took part in the study (see Table 1 for interviewee characteristics).

**Table 1: Interviewee characteristics**

Role	Use the ABCD2 score?
GP, Cambridgeshire	yes
GP, Cambridgeshire	no
GP, West Midlands	yes
Consultant	yes
Stroke specialist nurse	yes
Stroke staff nurse	no
A&E department triage nurse	no
Ultrasonographer	no
Clinic administrator	yes
Six Cambridgeshire patients	no
Six West Midlands patients	no

## Awareness of ABCD2 amongst patients

Although many of the patients spontaneously mentioned the FAST campaign<sup>12</sup>, none were aware that there was a system that calculated their risk of having a stroke after a suspected TIA, or that there was a related form that their GP might have used to assist making a referral. This finding is of particular interest in light of the significance the score is given by some GPs and hospital staff.

### Use of ABCD2 amongst health professionals

Even though a relatively small sample of GPs and secondary care staff who use the score were interviewed, a surprising variety of different uses for the proforma/ABCD2 score were described (See Tables 2 and 3).

**Table 2: Roles of the ABCD2 proforma with exemplar quotes**

1.	<b>Might generate medico-legal threat</b>	“You might have to justify in the future why you haven’t followed a guideline” (901, Cambridgeshire GP)
2.	<b>Demonstrates need for urgency to patient</b>	“it sometimes provokes a little bit of alarm” (701, Cambridgeshire GP)
3.	<b>Educates the patient</b>	“when things have sometimes had the hospital stamp of approval, it’s easier to explain things, so they see a clear-cut pathway basically” (702, Cambridgeshire GP)
4.	<b>Diagnostic tool</b>	“you’ve got the tick box, it helps define what is a TIA and that score thing is very helpful” (605, Birmingham GP)
5.	<b>Prognostic tool</b>	“a lower score makes it okay to send it to the next TIA clinic and a higher score you send it urgently” (702, Cambridgeshire GP)
6.	<b>Demonstrates need for urgency to the GP</b>	“It didn’t feel right to send somebody to hospital very urgently who seems perfectly alright... Having the score there sort of gives you a bit of confidence to do just that” (703, Cambridgeshire GP)
7.	<b>Facilitates smoother patient pathway</b>	“It’s just simpler because we know what they need and it’s a way of getting it” (610, Birmingham GP)
8.	<b>Educates/reminds the GP what to do</b>	“I usually dig it out if I’m thinking to refer somebody to that clinic just to remind myself... it’s always useful to have something in front of you” (605, Birmingham GP)
9.	<b>Distils a complex history</b>	“you simply go ‘Okay, you fit a number, you need to go in, we need to refer you, there’s a degree of urgency’” (701, Cambridgeshire GP)
10.	<b>Obscures a complex history</b>	“You get an idea from the actual GP, the history and what the

		patient's told you more than you can from the score really" (606, specialist nurse)
11.	<b>Misleading GPs about diagnosis</b>	"If you start from the right places, that this was a TIA, it's fine, but as I say, just because you're 80, you've got diabetes and hypertension, you automatically score three... so it has no diagnostic value, the ABCD2 score" (711, consultant)
12.	<b>Prevents inappropriate referrals</b>	"Some GPs lie to get them into clinic. Not so much now that we've changed the pro forma" (710, specialist nurse)
13.	<b>Barrier to appropriate care</b>	"Our vision... would be to have a TIA hotline... and using that system I wouldn't bother using the ABCD2 score" (602, consultant)

**Table 3: Comparing roles of the ABCD2 score by GPs and by hospital staff**

	<b>Primary care staff (nine GPs &amp; one A&amp;E triage nurse)</b>	<b>Specialist doctors, nurses &amp; administrator</b>	<b>Hospital support staff (technicians &amp; staff nurse)</b>
<b>Never use the score</b>	<b>40% (n=4)</b>		<b>100% (n=3)</b>
<b>Do use the score</b>	<b>60% (n=6)</b>	<b>100% (n=5)</b>	

<b>Might generate medico-legal threat</b>	X	
<b>Demonstrates need for urgency to patient</b>	X	
<b>Educates the patient</b>	X	
<b>Diagnostic tool</b>	X	
<b>Prognostic tool</b>	X	X
<b>Demonstrates need for urgency to the GP</b>	X	X
<b>Facilitates smoother patient pathway</b>	X	X
<b>Educates/reminds the GP what to do</b>	X	X
<b>Distils a complex history</b>	X	X
<b>Obscures a complex history</b>		X

<b>Misleading GPs about diagnosis</b>		<b>X</b>
<b>Prevents inappropriate referrals</b>		<b>X</b>
<b>Barrier to appropriate care</b>		<b>X</b>
<b>Note: X indicates this theme was raised by at least one of the participants of the sub-group</b>		

### **Use of the ABCD2 in general practice**

For those GPs who use the scoring system, it was clear that they both liked and complied with its use as it offers a tangible means to navigate the referral system. Most did not ever consider their scoring as inaccurate. However, they primarily regard it as the key mechanism to access services on behalf of a patient, at which point a more definitive diagnosis be made based on specialist expertise and technological procedures:

*It was just a case of looking, getting the score and then speaking to the medical liaison sister.... I think it's quite useful, I really quite like that scoring system because it does give you a bit of confidence about what to do, because otherwise it can be a bit nebulous.*

Cambridgeshire GP, 703

GPs described how they didn't feel the need to make a definitive diagnosis, but rather used the form to defer this to the hospital. Thus, the scoring system serves as a tool to systematise their evaluation of a patient within their consultation, yet also ensures a referral to secondary care happens swiftly.

When completing the form, GPs consider potentially relevant patient history to be a broad category. Beyond the specific clinical focus that might relate to a suspected TIA, many express how they cannot simply ignore a wide range of other factors that might possibly be central to the patients' current health status. These aspects, which are not part of the scoring system, can consequently influence how scores are eventually arrived at as GPs try to assess what the consequence of an overall score is likely to be:

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3 *Obviously each patient's not the same, so sometimes you do need a little bit of*  
4 *adaption.*  
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7 Birmingham GP, 608  
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10 GPs also adapted their own management in response to the form, for example using it to  
11 remind them about TIAs, to educate the patient, or to persuade patients that the problem  
12 was urgent and that referral needed to be carried out urgently.  
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### 15 16 17 **The ABCD2 use by hospital staff** 18

19 Hospital staff viewed the score more restrictively as a reliable record of the clinical event  
20 itself. As a result, they sometimes view the GPs approach as problematic or even  
21 careless, since it leads to what they view as inaccuracies and inappropriate referrals:  
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26 *If we all did what we're meant to, it would be great*  
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28 Stroke consultant, 711  
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31 Unlike the GPs, who view the score within their own consultations as a checklist to  
32 ensure sufficient scope of questioning and externally as a mechanism to justify referral,  
33 staff in the hospital see the score as ideally an objective evaluation of severity of  
34 prognosis.  
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40 *Our protocol I think it is quite clear... it's about a three or four page*  
41 *document, it gives them [GPs] advice on which medications to start, how*  
42 *to administer the ABCD2 score, and then lots of ways for different people.*  
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46 Stroke consultant 711  
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49 As a natural consequence of this perspective, patients who, it turns out, have not had  
50 TIAs but satisfied the scoring to some degree are said to "mimic" genuine TIA patients  
51 according to the criteria set out in the ABCD2 form:  
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3 *We get so many mimics referred to the clinic, making sure you're dealing with the*  
4 *right diagnosis is probably the first issue.*  
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7 Specialist nurse, 602  
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10 Various negative terms including “uneducated”, “inappropriate”, “challenging” and  
11 “dubious” are also used to describe referrals or patients in similar circumstances.  
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15 Many of the interviews with hospital staff acknowledged that a GP or emergency doctor  
16 may “misbehave” or “use [the TIA clinic] as a place to send patients they don't know  
17 what to do with” and refer patients that they know cannot be a “genuine” TIA. The  
18 ABCD2 score is also seen as potentially misleading when used inappropriately:  
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24 *I think we would say if you start from the right place, the ABCD2 scores would*  
25 *discriminate between the high risk and the low risk and people who need urgent*  
26 *and maybe less urgent investigations, but... a lot of people that we see in the*  
27 *clinic I'd imagine their age is probably somewhere in their 80s, then they*  
28 *inappropriately score high than other conditions. So it had no diagnostic value,*  
29 *the ABCD2 score, but it's got some prognostic value in relation to high risk, low*  
30 *risk stuff. So I think people are using it as a sort of diagnostic tool for TIA, that's*  
31 *how it's used inappropriately.*  
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39 Stroke consultant, 711  
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42 This concern about reliability, however, is most relevant if the ABCD2 proforma system  
43 is meant to serve exactly the same single purpose within both primary and secondary  
44 care. Secondary care users of the ABCD2 score emphasised the original intended use of  
45 the ABCD2 score (prognostication) more and discussed a greater number of negative  
46 alternate roles of the ABCD2 score (diagnostically confusing, obscuring the history, a  
47 barrier to appropriate care) versus primary care users of the ABCD2 score.  
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#### 54 **ABCD2 non-users** 55 56 57 58 59 60

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3 As noted, none of the 12 patients were aware of the role of the ABCD2 proforma in the  
4 management of their case, even though some GPs said they drew on it to explain and  
5 stress urgency to patients. Thus, although the ABCD2 proforma is a significant tool for  
6 many health professionals, it is probably not part of most patients' experience and does  
7 not influence how they relate to their problem. Our interviews also revealed that hospital  
8 staff not involved in triaging referrals - two radiographers and a nurse involved in  
9 scanning and caring for patients with TIA on a weekly basis - were also unaware of the  
10 ABCD2 score.  
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14 Similarly, a proportion of primary care staff interviewed also do not currently use the  
15 ABCD2 proforma (40%, n=4, three GPs and one A&E triage nurse). All cited lack of  
16 knowledge, but gave differing interpretations as to why this is so. One GP was  
17 "ashamed" but three interviewees felt they didn't use the score or proforma with good  
18 reason:  
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29 *I'm not familiar I have to say, but I think it would be mostly in my history*  
30 *already.*

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Cambridgeshire GP, 801

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*I don't think I was aware of it really, I imagine this is some sort of guideline*  
*system is it? ... you wouldn't believe how many guidelines there are.*

Cambridgeshire GP, 901

*If you're going to use a scoring system it needs to be universal... everybody needs*  
*to be aware of it for it to be an effective tool.*

A&E triage nurse, 714

Overall our findings describe both the varied use of the form, and also the way it  
functions to provide a simple linkage between primary and secondary care. When the  
ABCD2 proforma is not adopted, GPs rely on methods such as referral letters and  
sending patients directly to A&E, communication and contact is largely one way and is  
not shaped by the expectations of secondary care.

## Discussion

Whilst it might be argued that this study is limited by the number of interviews conducted, it nevertheless is based on a commitment to capture as broad a set of views from relevant actors as possible. The choice to focus on just two centres of practice (Birmingham and Cambridge), brings the advantage of being able to elicit some specific and subtle descriptions but inevitably limits the generalisation of findings. Nevertheless, the overall argument concerning the multiple function of the ABCD2 score, and the adoption of protocols more generally, is robust given the general consistency of the data collected.

Our interviews with a range of health professionals clearly show that the apparently simple ABCD2 scoring system adopted within GP referral proformas serves a variety of different roles. We identified 13 functions, both positive and negative; of these, five were shared, four were specific to GPs, and four were specific to hospital staff. Whilst we are not claiming that the classification is definitive or exactly defined, this variety suggests that the proforma does not only standardise but can also sustain sufficient flexibility to serve a range of local purposes. This suggests that efforts to improve prognostic accuracy of clinical prediction rules<sup>13-16</sup> should be accompanied by research and development of the other aspects of their usefulness.

Complex scientific fields such as medicine inevitably involve multiple domains of expertise, each of which has its own perspective and priorities that shapes the way things being studied are conceived and dealt with.<sup>17</sup> In order for pluralism across different subfields not to lead to fragmentation, there has to be what contemporary philosopher Hacking calls conceptual “unifiers” that span and integrate any discontinuities.<sup>18</sup> In this vein, the notion of a “boundary object” describes those things, whether material or theoretical, that are both sufficiently stable to be treated as the same thing by different groups of scientists, and yet also flexible enough for them to operate and make sense with each of the different subfields.<sup>11</sup>



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In our study of the referral of suspected TIA patients from GP practices to the TIA clinic, one might have initially assumed that the “boundary object” is the patient, since she obviously moves from one site to another and apparently aligns primary and secondary services. However, our interviews reveal that the patient is not considered the chief means by which the two sites connect and establish a common point of reference, rather, it is the completed ABCD2 form.

Clinical prediction research needs to have a post-implementation phase in order to understand how the original research is used in practice, since this will determine its ultimate effect on processes of care and clinical outcomes. In current clinical practice, GPs could utilise a greater awareness of how clinical prediction rules practically function to improve referrals and referral pathways, and should consider communicating their significance to patients.

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Ref Type: Generic

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**Varying uses of the ABCD2 scoring system in primary and secondary care: a qualitative study**

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52 **Contributors and guarantor:**

53 DE, SC, NM, SM and JM developed the original idea and protocol. DE, SC, NM and SV  
54 conducted the interviews. DE and SC led the qualitative analysis and drafted the paper.  
55 DE, SC, NM, SV, DL, SM, MG, RM and JM contributed to the writing of the final  
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Participants gave informed consent for transcripts to be used in research provided that quotes are anonymised and information used in reports could not lead to identification.

**ABSTRACT**

**Objectives:** To explore the usage of the ABCD2 risk stratification score by general practitioners and hospital staff during the referral of patients with suspected transient ischaemic attack (TIA) or minor stroke.

**Design:** Qualitative study using semi-structured interviews.

**Setting:** Nine general practices and two hospital sites in England (Birmingham and Cambridge).

**Participants:** Nine general practitioners, nine hospital staff (two consultants, four nurses, two ultrasonographers and one administrator).

**Results:** In both sites, clinicians used a referral proforma based around the ABCD2 scoring system for a range of purposes including self-education, to assist emphasising urgency to the patient, as a referral pathway facilitator and as a diagnostic tool. Negative views of its role included potential medico-legal threat, that it was a barrier to appropriate care, and led to mis-diagnosis. Despite having differing uses by different clinicians, the ABCD2 proforma was the central means of inter-professional communication in TIA referrals across both sites.

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4 **Conclusions:** Understanding how prediction rules are used in practice is key to  
5 determining their impact on processes of care and clinical outcomes. In practice, GPs and  
6 their colleagues use the ABCD2 score in subtly different ways and it functions as a  
7 “boundary object” by both accommodating these multiple purposes, yet still successfully  
8 aiding communication between them.  
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## Introduction

The ABCD2 score is a clinical prediction rule developed in 2007 to predict the risk of recurrent stroke soon after transient ischaemic attack (TIA) [Johnston et al 2007; Giles et al 2010]. The score has rapidly become an integral part of the referral process for TIA internationally [NICE 2008; RCP 2010; Easton et al 2009; National Stroke Foundation 2008; Stroke Foundation of New Zealand 2008] and often forms part of a “proforma” – a form which integrates standardised protocols and frequently clinical prediction rules – for referrals to secondary care. Such proformas are increasingly common for primary to secondary care communication: in April 2011 Addenbrookes Hospital in Cambridge, UK, requested the use of a proforma for 48 conditions ranging from early inflammatory arthritis to suspected renal colic.

Despite the increasing use of proformas, there is only limited research into their use or impact [Akbari et al 2008]. For example, the ABCD2 score was derived and validated in secondary care as a prognostic score, yet the UK’s National Institute for Health and Clinical Excellence [NICE 2008] recommends its use in all referrals of suspected TIA by General Practitioners (GPs) and accident and emergency (A&E) departments despite evidence of substantial disagreement between specialist and generalist scores [Kinsella et al 2011 and Wong et al 2012]. We studied the ABCD2 score’s use across different parts of the health service in order to analyse how the score and its associated proforma are used in everyday clinical practice.

### Box 1: Description of the ABCD2 clinical prediction rule for stroke risk after TIA

Age $\geq$ 60	1 point
Blood Pressure $\geq$ 140/90 mmHg at acute evaluation	1 point
Clinical features	1 point for speech disturbance without weakness; 2 points for unilateral weakness
Duration	1 point for 10-59 minutes, 2 points for $\geq$ 60 minutes
Diabetes	1 point
Patients scoring 4 or more points are deemed high risk. [NICE 2008]	

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3 Our theoretical background comes from an area of social science research that looks at  
4 the increasing role of forms and other systems of standardisation in medical practice.  
5 Although protocols are frequently criticised because they constrain and dictate practice,  
6 rendering individual decision-making redundant, Timmermans and Berg [1997] argue  
7 that this criticism is misplaced. Rather, an inherent aspect of any useful protocol is that it  
8 can accommodate local deviation. Individuals invariably ‘tinker’ with them, whilst  
9 ensuring they are not undermined, such that they are workable for each specific  
10 circumstance. As a result, a protocol often becomes what has been termed a ‘boundary  
11 object’ [Leigh Star 2010]. This term refers to any item or procedure that is sufficiently  
12 standardised to ensure a common meaning or action is established across different  
13 specialist fields, yet also is sufficiently flexible to allow for adaptation to make it useful  
14 and meaningful in local contexts. As a result, though there may well be significant  
15 differences between various locations or areas of expertise, boundary objects serve to  
16 provide common ground, and are thus a way of establishing overall coherence and  
17 integration.  
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## 32 **Methods**

### 33 **Participants and procedures**

34 This study was a prelude to a randomised controlled trial of a novel method for stroke  
35 prevention in primary care. Participants were recruited from two locations  
36 (Cambridgeshire/Addenbrookes hospital and West Midlands/Queen Elizabeth hospital) to  
37 permit exploration of variation between sites. The TIA clinics in both areas had  
38 independently created proformas which they requested be completed for all referrals, in  
39 which the ABCD2 score was central.  
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48 Eligible GPs had to be within the catchment area of Addenbrooke’s or Queen  
49 Elizabeth hospital TIA clinic while staff members included any within these  
50 hospitals who regularly encountered patients with suspected TIA. GPs were  
51 approached by e-mail using the mailing lists of local research networks with one  
52 sampling criteria, that there should be a mix of GPs from Birmingham and  
53 Cambridgeshire (these GPs had an obligation and/or interest in participating in  
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3 research generally, and so this convenience sampling method greatly increased  
4 our response rate and reduced the chance of exclusively recruiting stroke  
5 enthusiasts), and nine of ten volunteer GPs contacted were interviewed: in total  
6 we interviewed six Cambridgeshire GPs and three Birmingham GPs. We  
7 identified our sample of secondary care informants by adopting a “snowball  
8 method”, starting with a consultant interview at each site and then progressively  
9 identifying key players in the TIA referral process: as a result we identified a  
10 cross section of staff involved in many potential TIA management pathways.  
11 Interviewees were approached by e-mail, telephone or in person, often with the  
12 assistance of the previous interviewee; all approached interviewees consented to  
13 interview: in total we interviewed two stroke consultants; three stroke nurses; two  
14 ultrasonographers involved in assessing TIA patients; one stroke team  
15 administrator (who liaised with patients, GPs and ensured ABCD2 score  
16 proformas were actioned) and one A&E triaging nurse. Five of the hospital staff  
17 came from Queen Elizabeth Hospital and four from Addenbrookes, with an equal  
18 number of doctors (one) and nurses (two) from each site.  
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### 33 **Interviews**

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35 Face-to-face interviews followed a topic guide generated by the research team that was  
36 initially piloted. The focus was not specifically on the ABCD2 form, but rather to  
37 establish a qualitative understanding of experiences along the pathway from GP  
38 consultation to TIA clinic referral, inviting professionals to draw on past cases they had  
39 referred or been referred. Written consent was confirmed prior to interview, and  
40 interviews lasted on average one hour. They were audio-recorded and then transcribed  
41 verbatim by a professional transcription service. DE, NM (both GPs), SC (medical  
42 anthropologist), and SV (qualitative researcher) conducted the interviews at the hospital  
43 site (hospital staff members) or at the GP’s practice (GPs).. The interviewer checked the  
44 full transcription against the audio-recording for accuracy. Question prompts are  
45 provided as an appendix.  
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### 55 **Analysis**

DE, SC and NM read through the transcripts and established central themes that were raised. An initial sample of transcripts was coded independently by DE and SC (using NVivo) to ensure reliability and to revise codes where necessary. Subsequent themes that emerged as these were applied to the remaining transcripts were always discussed within the team, and if adopted, coded across the entire dataset.

It was clear that much discussion regarding suspected TIAs - when it was appropriate to refer, whether they should be considered urgent cases, and possible patient pathways that could be followed - centred on the current use of the ABCD2 proforma. This was therefore identified as a pivotal issue that would serve to capture many of the more general comments made, and provide a specific focus to explore how a suspected TIA is negotiated in referral pathways. As a result, DE and SC undertook further analysis of the transcripts; any direct or indirect mention of the ABCD2 scoring system, or practical use of a proforma in the referral pathway, was consequently noted in every transcript in a thematic analysis. Further coding allowed a detailed typology of varying roles associated with the ABCD2 score and the proforma itself (if used); this included both positive and negative features of its use.

## Results

Nine GPs and nine hospital staff took part in the study (see Table 1 for interviewee characteristics).

**Table 1: Interviewee characteristics**

Role	Use the ABCD2 score?
GP, Cambridgeshire	yes
GP, Cambridgeshire	no
GP, West Midlands	yes
Consultant	yes
Stroke specialist nurse	yes
Stroke staff nurse	no
A&E department triage nurse	no

Ultrasonographer	no
Clinic administrator	yes

### Use of ABCD2 amongst health professionals

Even though a relatively small sample of GPs and secondary care staff who use the score were interviewed, a surprising variety of different uses for the proforma/ABCD2 score were described (See Tables 2 and 3).

**Table 2: Roles of the ABCD2 proforma with exemplar quotes**

1.	<b>Might generate medico-legal threat</b>	“You might have to justify in the future why you haven’t followed a guideline” (901, Cambridgeshire GP)
2.	<b>Demonstrates need for urgency to patient</b>	“it sometimes provokes a little bit of alarm” (701, Cambridgeshire GP)
3.	<b>Educates the patient</b>	“when things have sometimes had the hospital stamp of approval, it’s easier to explain things, so they see a clear-cut pathway basically” (702, Cambridgeshire GP)
4.	<b>Diagnostic tool</b>	“you’ve got the tick box, it helps define what is a TIA and that score thing is very helpful” (605, Birmingham GP)
5.	<b>Prognostic tool</b>	“a lower score makes it okay to send it to the next TIA clinic and a higher score you send it urgently” (702, Cambridgeshire GP)
6.	<b>Demonstrates need for urgency to the GP</b>	“It didn’t feel right to send somebody to hospital very urgently who seems perfectly alright... Having the score there sort of gives you a bit of confidence to do just that” (703, Cambridgeshire GP)
7.	<b>Facilitates smoother patient pathway</b>	“It’s just simpler because we know what they need and it’s a way of getting it” (610, Birmingham GP)
8.	<b>Educates/reminds the GP what to do</b>	“I usually dig it out if I’m thinking to refer somebody to that clinic just to remind myself... it’s always useful to have something in front of you” (605, Birmingham GP)
9.	<b>Distils a complex history</b>	“you simply go ‘Okay, you fit a number, you need to go in, we need to refer you, there’s a degree of urgency’” (701, Cambridgeshire GP)
10.	<b>Obscures a complex history</b>	“You get an idea from the actual GP, the history and what the patient’s told you more than you can from the score really” (606,

		specialist nurse)
11.	<b>Misleading GPs about diagnosis</b>	“If you start from the right places, that this was a TIA, it’s fine, but as I say, just because you’re 80, you’ve got diabetes and hypertension, you automatically score three... so it has no diagnostic value, the ABCD2 score” (711, consultant)
12.	<b>Prevents inappropriate referrals</b>	“Some GPs lie to get them into clinic. Not so much now that we’ve changed the pro forma” (710, specialist nurse)
13.	<b>Barrier to appropriate care</b>	“Our vision... would be to have a TIA hotline... and using that system I wouldn’t bother using the ABCD2 score” (602, consultant)

**Table 3: Comparing roles of the ABCD2 score by GPs and by hospital staff**

	<b>Primary care staff (nine GPs &amp; one A&amp;E triage nurse)</b>	<b>Specialist doctors, nurses &amp; administrator</b>	<b>Hospital support staff (technicians &amp; staff nurse)</b>
<b>Never use the score</b>	<b>40% (n=4)</b>		<b>100% (n=3)</b>
<b>Do use the score</b>	<b>60% (n=6)</b>	<b>100% (n=5)</b>	

<b>Might generate medico-legal threat</b>	<b>X</b>	
<b>Demonstrates need for urgency to patient</b>	<b>X</b>	
<b>Educates the patient</b>	<b>X</b>	
<b>Diagnostic tool</b>	<b>X</b>	
<b>Prognostic tool</b>	<b>X</b>	<b>X</b>
<b>Demonstrates need for urgency to the GP</b>	<b>X</b>	<b>X</b>
<b>Facilitates smoother patient pathway</b>	<b>X</b>	<b>X</b>
<b>Educates/reminds the GP what to do</b>	<b>X</b>	<b>X</b>
<b>Distils a complex history</b>	<b>X</b>	<b>X</b>
<b>Obscures a complex history</b>		<b>X</b>
<b>Misleading GPs about diagnosis</b>		<b>X</b>

Prevents inappropriate referrals		X
Barrier to appropriate care		X
Note: X indicates this theme was raised by at least one of the participants of the sub-group		

### Use of the ABCD2 in general practice

For those GPs who use the scoring system, it was clear that they both liked and complied with its use as it offers a tangible means to navigate the referral system. Most did not ever consider their scoring as inaccurate. However, they primarily regard it as the key mechanism to access services on behalf of a patient, at which point a more definitive diagnosis be made based on specialist expertise and technological procedures:

*It was just a case of looking, getting the score and then speaking to the medical liaison sister.... I think it's quite useful, I really quite like that scoring system because it does give you a bit of confidence about what to do, because otherwise it can be a bit nebulous.*

Cambridgeshire GP, 703

GPs described how they didn't feel the need to make a definitive diagnosis, but rather used the form to defer this to the hospital. Thus, the scoring system serves as a tool to systematise their evaluation of a patient within their consultation, yet also ensures a referral to secondary care happens swiftly.

When completing the form, GPs consider potentially relevant patient history to be a broad category. Beyond the specific clinical focus that might relate to a suspected TIA, many express how they cannot simply ignore a wide range of other factors that might possibly be central to the patients' current health status. These aspects, which are not part of the scoring system, can consequently influence how scores are eventually arrived at as GPs try to assess what the consequence of an overall score is likely to be:

*Obviously each patient's not the same, so sometimes you do need a little bit of adaption.*

Birmingham GP, 608

GPs also adapted their own management in response to the form, for example using it to remind them about TIAs, to educate the patient, or to persuade patients that the problem was urgent and that referral needed to be carried out urgently.

### **The ABCD2 use by hospital staff**

Hospital staff viewed the score more restrictively as a reliable record of the clinical event itself. As a result, they sometimes view the GPs approach as problematic or even careless, since it leads to what they view as inaccuracies and inappropriate referrals:

*If we all did what we're meant to, it would be great*

Stroke consultant, 711

Unlike the GPs, who view the score within their own consultations as a checklist to ensure sufficient scope of questioning and externally as a mechanism to justify referral, staff in the hospital see the score as ideally an objective evaluation of severity of prognosis.

*Our protocol I think it is quite clear... it's about a three or four page document, it gives them [GPs] advice on which medications to start, how to administer the ABCD2 score, and then lots of ways for different people.*

Stroke consultant 711

As a natural consequence of this perspective, patients who, it turns out, have not had TIAs but satisfied the scoring to some degree are said to “mimic” genuine TIA patients according to the criteria set out in the ABCD2 form:

*We get so many mimics referred to the clinic, making sure you're dealing with the right diagnosis is probably the first issue.*

Specialist nurse, 602



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5 Various negative terms including “uneducated”, “inappropriate”, “challenging” and  
6 “dubious” are also used to describe referrals or patients in similar circumstances.  
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10 Many of the interviews with hospital staff acknowledged that a GP or emergency doctor  
11 may “misbehave” or “use [the TIA clinic] as a place to send patients they don’t know  
12 what to do with” and refer patients that they know cannot be a “genuine” TIA. The  
13 ABCD2 score is also seen as potentially misleading when used inappropriately:  
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19 *I think we would say if you start from the right place, the ABCD2 scores would*  
20 *discriminate between the high risk and the low risk and people who need urgent*  
21 *and maybe less urgent investigations, but... a lot of people that we see in the*  
22 *clinic I'd imagine their age is probably somewhere in their 80s, then they*  
23 *inappropriately score high than other conditions. So it had no diagnostic value,*  
24 *the ABCD2 score, but it's got some prognostic value in relation to high risk, low*  
25 *risk stuff. So I think people are using it as a sort of diagnostic tool for TIA, that's*  
26 *how it's used inappropriately.*  
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33 Stroke consultant, 711  
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37 This concern about reliability, however, is most relevant if the ABCD2 proforma system  
38 is meant to serve exactly the same single purpose within both primary and secondary  
39 care. Secondary care users of the ABCD2 score emphasised the original intended use of  
40 the ABCD2 score (prognostication) more and discussed a greater number of negative  
41 alternate roles of the ABCD2 score (diagnostically confusing, obscuring the history, a  
42 barrier to appropriate care) versus primary care users of the ABCD2 score.  
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#### 49 **ABCD2 non-users**

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51 Our interviews revealed that hospital staff not involved in triaging referrals - two  
52 radiographers and a nurse involved in scanning and caring for patients with TIA on a  
53 weekly basis - were unaware of the ABCD2 score. Similarly, a proportion of primary  
54 care staff interviewed also do not currently use the ABCD2 proforma (40%, n=4, three  
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3 GPs and one A&E triage nurse). All cited lack of knowledge, but gave differing  
4 interpretations as to why this is so. One GP was “ashamed” but three interviewees felt  
5 they didn’t use the score or proforma with good reason:  
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10 *I’m not familiar I have to say, but I think it would be mostly in my history*  
11 *already.*

12  
13 Cambridge GP, 801

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17 *I don’t think I was aware of it really, I imagine this is some sort of guideline*  
18 *system is it? ... you wouldn’t believe how many guidelines there are.*

19  
20 Cambridge GP, 901

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23  
24 *If you’re going to use a scoring system it needs to be universal... everybody needs*  
25 *to be aware of it for it to be an effective tool.*

26  
27 A&E triage nurse, 714

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31 Overall our findings describe both the varied use of the form, and also the way it  
32 functions to provide a simple linkage between primary and secondary care. When the  
33 ABCD2 proforma is not adopted, GPs rely on methods such as referral letters and  
34 sending patients directly to A&E, communication and contact is largely one way and is  
35 not shaped by the expectations of secondary care.  
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## 39 40 41 **Discussion**

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43 Whilst it might be argued that this study is limited by the number of interviews  
44 conducted, it nevertheless is based on a commitment to capture as broad a set of views  
45 from relevant actors as possible. The choice to focus on just two centres of practice  
46 (Birmingham and Cambridge), brings the advantage of being able to elicit some specific  
47 and subtle descriptions but inevitably limits the generalisation of findings. Nevertheless,  
48 the overall argument concerning the multiple function of the ABCD2 score, and the  
49 adoption of protocols more generally, is robust given the general consistency of the data  
50 collected.  
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3 Our interviews with a range of health professionals clearly show that the apparently  
4 simple ABCD2 scoring system adopted within GP referral proformas serves a variety of  
5 different roles. We identified 13 functions, both positive and negative; of these, five were  
6 shared, four were specific to GPs, and four were specific to hospital staff. Whilst we are  
7 not claiming that the classification is definitive or exactly defined, this variety suggests  
8 that the proforma does not only standardise but can also sustain sufficient flexibility to  
9 serve a range of local purposes. This suggests that efforts to improve prognostic accuracy  
10 of clinical prediction rules [Calvet et al 2009; Asimos et al 2009; Ay et al 2009; Giles et  
11 al 2010] should be accompanied by research and development of the other aspects of  
12 their usefulness.  
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22 Complex scientific fields such as medicine inevitably involve multiple domains of  
23 expertise, each of which has its own perspective and priorities that shapes the way things  
24 being studied are conceived and dealt with [Mol, 2002]. In order for pluralism across  
25 different subfields not to lead to fragmentation, there has to be what contemporary  
26 philosopher Hacking [1996] calls conceptual “unifiers” that span and integrate any  
27 discontinuities. In this vein, the notion of a “boundary object” describes those things,  
28 whether material or theoretical, that are both sufficiently stable to be treated as the same  
29 thing by different groups of scientists, and yet also flexible enough for them to operate  
30 and make sense with each of the different subfields [Leigh Star 2010].  
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40 In our study of the referral of suspected TIA patients from GP practices to the TIA clinic,  
41 one might have initially assumed that the “boundary object” is the patient, since she  
42 obviously moves from one site to another and apparently aligns primary and secondary  
43 services. However, our interviews reveal that the patient is not considered the chief  
44 means by which the two sites connect and establish a common point of reference, rather,  
45 it is the completed ABCD2 form.  
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51 Clinical prediction research needs to have a post-implementation phase in order to  
52 understand how the original research is used in practice, since this will determine its  
53 ultimate effect on processes of care and clinical outcomes. In current clinical practice,  
54 GPs could utilise a greater awareness of how clinical prediction rules practically function  
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3 to improve referrals and referral pathways, and should consider communicating their  
4 significance to patients.  
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**Title:**

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48 the submitted work.  
49  
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51  
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53 DE, SC, NM, SM and JM developed the original idea and protocol. DE, SC, NM and SV  
54 conducted the interviews. DE and SC led the qualitative analysis and drafted the paper.  
55 DE, SC, NM, SV, DL, SM, MG, RM and JM contributed to the writing of the final  
56 version of the paper. DE is the guarantor.  
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Participants gave informed consent for transcripts to be used in research provided that quotes are anonymised and information used in reports could not lead to identification.

**ABSTRACT**

**Objectives:** To explore the usage of the ABCD2 risk stratification score by general practitioners and hospital staff during the referral of patients with suspected transient ischaemic attack (TIA) or minor stroke.

**Design:** Qualitative study using semi-structured interviews.

**Setting:** Nine general practices and two hospital sites in England (Birmingham and Cambridge).

**Participants:** Nine general practitioners, nine hospital staff (two consultants, four nurses, two ultrasonographers and one administrator), ~~and 12 patients with recently suspected transient ischaemic attack or minor stroke (within the previous three months).~~

**Results:** In both sites, clinicians used a referral proforma based around the ABCD2 scoring system for a range of purposes including self-education, to assist emphasising urgency to the patient, as a referral pathway facilitator and as a diagnostic tool. Negative views of its role included potential medico-legal threat, that it was a barrier to appropriate care, and led to mis-diagnosis. Despite having differing uses by different clinicians, the ABCD2 proforma was the central means of inter-professional communication in TIA referrals across both sites. ~~No patients were aware of their ABCD2 score.~~

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3 **Conclusions:** Understanding how prediction rules are used in practice is key to  
4 determining their impact on processes of care and clinical outcomes. In practice, GPs and  
5 their colleagues use the ABCD2 score in subtly different ways and it functions as a  
6 “boundary object” by both accommodating these multiple purposes, yet still successfully  
7 aiding communication between them.  
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## Introduction

The ABCD2 score is a clinical prediction rule developed in 2007 to predict the risk of recurrent stroke soon after transient ischaemic attack (TIA) [Johnston et al 2007; [Giles et al 2010](#)]. The score has rapidly become an integral part of the referral process for TIA internationally [NICE 2008; RCP 2010; Easton et al 2009; National Stroke Foundation 2008; Stroke Foundation of New Zealand 2008] and often forms part of a “proforma” – a form which integrates standardised protocols and frequently clinical prediction rules – for referrals to secondary care. Such proformas are increasingly common for primary to secondary care communication: in April 2011 Addenbrookes Hospital in Cambridge, UK, requested the use of a proforma for 48 conditions ranging from early inflammatory arthritis to suspected renal colic.

Despite the increasing use of proformas, there is only limited research into their use or impact [Akbari et al 2008]. For example, the ABCD2 score was derived and validated in secondary care as a prognostic score, yet the UK’s National Institute for Health and Clinical Excellence [NICE 2008] recommends its use in all referrals of suspected TIA by General Practitioners (GPs) and accident and emergency (A&E) departments despite evidence of substantial disagreement between specialist and generalist scores [Kinsella et al 2011 and Wong et al 2012]. We studied the ABCD2 score’s use across different parts of the health service in order to analyse how the score and its associated proforma are used in everyday clinical practice.

### Box 1: Description of the ABCD2 clinical prediction rule for stroke risk after TIA

Age $\geq$ 60	1 point
Blood Pressure $\geq$ 140/90 mmHg at acute evaluation	1 point
Clinical features	1 point for speech disturbance without weakness; 2 points for unilateral weakness
Duration	1 point for 10-59 minutes, 2 points for $\geq$ 60 minutes
Diabetes	1 point
Patients scoring 4 or more points are deemed high risk. [NICE 2008]	

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Our theoretical background comes from an area of social science research that looks at the increasing role of forms and other systems of standardisation in medical practice. Although protocols are frequently criticised because they constrain and dictate practice, rendering individual decision-making redundant, Timmermans and Berg [1997] argue that this criticism is misplaced. Rather, an inherent aspect of any useful protocol is that it can accommodate local deviation. Individuals invariably ‘tinker’ with them, whilst ensuring they are not undermined, such that they are workable for each specific circumstance. As a result, a protocol often becomes what has been termed a ‘boundary object’ [Leigh Star 2010]. This term refers to any item or procedure that is sufficiently standardised to ensure a common meaning or action is established across different specialist fields, yet also is sufficiently flexible to allow for adaptation to make it useful and meaningful in local contexts. As a result, though there may well be significant differences between various locations or areas of expertise, boundary objects serve to provide common ground, and are thus a way of establishing overall coherence and integration.

## Methods

### Participants and procedures

This study was a prelude to a randomised controlled trial of a novel method for stroke prevention in primary care. Participants were recruited from two locations (Cambridgeshire/Addenbrookes hospital and West Midlands/Queen Elizabeth hospital) to permit exploration of variation between sites. The TIA clinics in both areas had independently created proformas which they requested be completed for all referrals, in which the ABCD2 score was central.

Eligible GPs had to be within the catchment area of Addenbrooke’s or Queen Elizabeth hospital TIA clinic while staff members included any within these hospitals who regularly encountered patients with suspected TIA. GPs were approached by e-mail using the mailing lists of local research networks with one sampling criteria, that there should be a mix of GPs from Birmingham and Cambridgeshire (these GPs had an obligation and/or interest in participating in research generally, and so this convenience sampling

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3 method greatly increased our response rate and reduced the chance of exclusively  
4 recruiting stroke enthusiasts rather than being stroke research enthusiasts), and all nine of  
5 ten volunteer GPs with whom we could arrange interviews contacted were interviewed:  
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7 in total we interviewed six Cambridgeshire GPs and three Birmingham GPs. We  
8 identified our sample of secondary care informants by adopting a “easeade-snowball  
9 method”, starting with a consultant interview at each site and then progressively  
10 identifying key players in the TIA referral process: based on discussing in depth with  
11 each interviewee with whom they had significantly liaised. As a result we identified a  
12 cross section of staff we might otherwise have missed involved in many potential TIA  
13 management pathways. Interviewees were approached by e-mail, telephone or in person,  
14 often with the assistance of the previous interviewee; all approached interviewees  
15 consented to interview: in total we interviewed six Cambridgeshire GPs and three  
16 Birmingham GPs; two stroke consultants; three stroke nurses; two ultrasonographers  
17 involved in assessing TIA patients; one stroke team administrator (who liaised with  
18 patients, GPs and ensured ABCD2 score proformas were actioned) and one A&E triaging  
19 nurse. Five of the hospital staff came from Queen Elizabeth Hospital and four from  
20 Addenbrookes, with an equal number of doctors (one) and nurses (two) from each site.

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35 In addition, twelve patients were interviewed in their homes within 3 months of being  
36 seen in the Addenbrookes or Queen Elizabeth hospital clinic with a suspected TIA. Of  
37 these, seven had had a TIA or minor stroke diagnosis confirmed.  
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### 44 Interviews

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46 Face-to-face interviews followed a topic guide generated by the research team that was  
47 initially piloted. The focus was not specifically on the ABCD2 form, but rather to  
48 establish a qualitative understanding of experiences along the pathway from GP  
49 consultation to TIA clinic referral, inviting professionals to draw on past cases they had  
50 referred or been referred. A set of interviews with patients was also conducted; these  
51 form a very limited part of our analysis here as in all twelve cases they were unaware of  
52 the ABCD2 score or its role in their referral. Written consent was confirmed prior to  
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3 | interview, and iInterviews lasted on average one hour. They were audio-recorded and  
4 then transcribed verbatim by a professional transcription service. DE, NM (both GPs), SC  
5 (medical anthropologist), and SV (qualitative researcher) conducted the interviews at the  
6 hospital site (hospital staff members) or, at the GP's practice (GPs) ~~or at the patient's~~  
7 ~~home~~. The interviewer checked the full transcription against the audio-recording for  
8 accuracy. Question prompts are provided as an appendix.  
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### 14 15 16 **Analysis**

17 DE, SC and NM read through the transcripts and established central themes that were  
18 raised. An initial sample of transcripts was coded independently by DE and SC (using  
19 NVivo) to ensure reliability and to revise codes where necessary. Subsequent themes that  
20 emerged as these were applied to the remaining transcripts were always discussed within  
21 the team, and if adopted, coded across the entire dataset.  
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28 It was clear that much discussion regarding suspected TIAs - when it was appropriate to  
29 refer, whether they should be considered urgent cases, and possible patient pathways that  
30 could be followed - centred on the current use of the ABCD2 proforma. This was  
31 therefore identified as a pivotal issue that would serve to capture many of the more  
32 general comments made, and provide a specific focus to explore how a suspected TIA is  
33 negotiated in referral pathways. As a result, DE and SC undertook further analysis of the  
34 transcripts; any direct or indirect mention of the ABCD2 scoring system, or practical use  
35 of a proforma in the referral pathway, was consequently noted in every transcript in a  
36 thematic analysis. Further coding allowed a detailed typology of varying roles associated  
37 with the ABCD2 score and the proforma itself (if used); this included both positive and  
38 negative features of its use.  
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### 49 **Results**

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51 | Nine GPs ~~, twelve patients,~~ and nine hospital staff took part in the study (see Table 1 for  
52 interviewee characteristics).  
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#### 56 **Table 1: Interviewee characteristics**

Role	Use the ABCD2 score?
GP, Cambridgeshire	yes
GP, Cambridgeshire	no
GP, West Midlands	yes
Consultant	yes
Stroke specialist nurse	yes
Stroke staff nurse	no
A&E department triage nurse	no
Ultrasonographer	no
Clinic administrator	yes
<b>Six Cambridgeshire patients</b>	<b>no</b>
<b>Six West Midlands patients</b>	<b>no</b>

### **Awareness of ABCD2 amongst patients**

~~Although many of the patients spontaneously mentioned the FAST campaign<sup>12</sup>, none were aware that there was a system that calculated their risk of having a stroke after a suspected TIA, or that there was a related form that their GP might have used to assist making a referral. This finding is of particular interest in light of the significance the score is given by some GPs and hospital staff.~~

### **Use of ABCD2 amongst health professionals**

Even though a relatively small sample of GPs and secondary care staff who use the score were interviewed, a surprising variety of different uses for the proforma/ABCD2 score were described (See Tables 2 and 3).

**Table 2: Roles of the ABCD2 proforma with exemplar quotes**

1.	<b>Might generate medico-legal threat</b>	“You might have to justify in the future why you haven’t followed a guideline” (901, Cambridgeshire GP)
2.	<b>Demonstrates need for urgency to patient</b>	“it sometimes provokes a little bit of alarm” (701, Cambridgeshire GP)
3.	<b>Educates the patient</b>	“when things have sometimes had the hospital stamp of approval, it’s easier to explain things, so they see a clear-cut pathway

		basically” (702, Cambridgeshire GP)
4.	<b>Diagnostic tool</b>	“you’ve got the tick box, it helps define what is a TIA and that score thing is very helpful” (605, Birmingham GP)
5.	<b>Prognostic tool</b>	“a lower score makes it okay to send it to the next TIA clinic and a higher score you send it urgently” (702, Cambridgeshire GP)
6.	<b>Demonstrates need for urgency to the GP</b>	“It didn’t feel right to send somebody to hospital very urgently who seems perfectly alright... Having the score there sort of gives you a bit of confidence to do just that” (703, Cambridgeshire GP)
7.	<b>Facilitates smoother patient pathway</b>	“It’s just simpler because we know what they need and it’s a way of getting it” (610, Birmingham GP)
8.	<b>Educates/reminds the GP what to do</b>	“I usually dig it out if I’m thinking to refer somebody to that clinic just to remind myself... it’s always useful to have something in front of you” (605, Birmingham GP)
9.	<b>Distils a complex history</b>	“you simply go ‘Okay, you fit a number, you need to go in, we need to refer you, there’s a degree of urgency’” (701, Cambridgeshire GP)
10.	<b>Obscures a complex history</b>	“You get an idea from the actual GP, the history and what the patient’s told you more than you can from the score really” (606, specialist nurse)
11.	<b>Misleading GPs about diagnosis</b>	“If you start from the right places, that this was a TIA, it’s fine, but as I say, just because you’re 80, you’ve got diabetes and hypertension, you automatically score three... so it has no diagnostic value, the ABCD2 score” (711, consultant)
12.	<b>Prevents inappropriate referrals</b>	“Some GPs lie to get them into clinic. Not so much now that we’ve changed the pro forma” (710, specialist nurse)
13.	<b>Barrier to appropriate care</b>	“Our vision... would be to have a TIA hotline... and using that system I wouldn’t bother using the ABCD2 score” (602, consultant)

**Table 3: Comparing roles of the ABCD2 score by GPs and by hospital staff**

	<b>Primary care staff (nine GPs &amp; one A&amp;E triage nurse)</b>	<b>Specialist doctors, nurses &amp; administrator</b>	<b>Hospital support staff (technicians &amp; staff nurse)</b>
<b>Never use the score</b>	<b>40% (n=4)</b>		<b>100% (n=3)</b>
<b>Do use the score</b>	<b>60% (n=6)</b>	<b>100% (n=5)</b>	



Might generate medico-legal threat	X	
Demonstrates need for urgency to patient	X	
Educates the patient	X	
Diagnostic tool	X	
Prognostic tool	X	X
Demonstrates need for urgency to the GP	X	X
Facilitates smoother patient pathway	X	X
Educates/reminds the GP what to do	X	X
Distils a complex history	X	X
Obscures a complex history		X
Misleading GPs about diagnosis		X
Prevents inappropriate referrals		X
Barrier to appropriate care		X
Note: X indicates this theme was raised by at least one of the participants of the sub-group		

### Use of the ABCD2 in general practice

For those GPs who use the scoring system, it was clear that they both liked and complied with its use as it offers a tangible means to navigate the referral system. Most did not ever consider their scoring as inaccurate. However, they primarily regard it as the key mechanism to access services on behalf of a patient, at which point a more definitive diagnosis be made based on specialist expertise and technological procedures:

*It was just a case of looking, getting the score and then speaking to the medical liaison sister.... I think it's quite useful, I really quite like that scoring system because it does give you a bit of confidence about what to do, because otherwise it can be a bit nebulous.*

Cambridgeshire GP, 703

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5 GPs described how they didn't feel the need to make a definitive diagnosis, but rather  
6 used the form to defer this to the hospital. Thus, the scoring system serves as a tool to  
7 systematise their evaluation of a patient within their consultation, yet also ensures a  
8 referral to secondary care happens swiftly.  
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14 When completing the form, GPs consider potentially relevant patient history to be a  
15 broad category. Beyond the specific clinical focus that might relate to a suspected TIA,  
16 many express how they cannot simply ignore a wide range of other factors that might  
17 possibly be central to the patients' current health status. These aspects, which are not part  
18 of the scoring system, can consequently influence how scores are eventually arrived at as  
19 GPs try to assess what the consequence of an overall score is likely to be:  
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26 *Obviously each patient's not the same, so sometimes you do need a little bit of*  
27 *adaption.*  
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30 Birmingham GP, 608  
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34 GPs also adapted their own management in response to the form, for example using it to  
35 remind them about TIAs, to educate the patient, or to persuade patients that the problem  
36 was urgent and that referral needed to be carried out urgently.  
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#### 40 **The ABCD2 use by hospital staff**

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42 Hospital staff viewed the score more restrictively as a reliable record of the clinical event  
43 itself. As a result, they sometimes view the GPs approach as problematic or even  
44 careless, since it leads to what they view as inaccuracies and inappropriate referrals:  
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49 *If we all did what we're meant to, it would be great*  
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52 Stroke consultant, 711  
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55 Unlike the GPs, who view the score within their own consultations as a checklist to  
56 ensure sufficient scope of questioning and externally as a mechanism to justify referral,  
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3 staff in the hospital see the score as ideally an objective evaluation of severity of  
4 prognosis.  
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9 *Our protocol I think it is quite clear... it's about a three or four page*  
10 *document, it gives them [GPs] advice on which medications to start, how*  
11 *to administer the ABCD2 score, and then lots of ways for different people.*

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14 Stroke consultant 711  
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17 As a natural consequence of this perspective, patients who, it turns out, have not had  
18 TIAs but satisfied the scoring to some degree are said to “mimic” genuine TIA patients  
19 according to the criteria set out in the ABCD2 form:  
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24 *We get so many mimics referred to the clinic, making sure you're dealing with the*  
25 *right diagnosis is probably the first issue.*  
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28 Specialist nurse, 602  
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31 Various negative terms including “uneducated”, “inappropriate”, “challenging” and  
32 “dubious” are also used to describe referrals or patients in similar circumstances.  
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37 Many of the interviews with hospital staff acknowledged that a GP or emergency doctor  
38 may “misbehave” or “use [the TIA clinic] as a place to send patients they don't know  
39 what to do with” and refer patients that they know cannot be a “genuine” TIA. The  
40 ABCD2 score is also seen as potentially misleading when used inappropriately:  
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45 *I think we would say if you start from the right place, the ABCD2 scores would*  
46 *discriminate between the high risk and the low risk and people who need urgent*  
47 *and maybe less urgent investigations, but... a lot of people that we see in the*  
48 *clinic I'd imagine their age is probably somewhere in their 80s, then they*  
49 *inappropriately score high than other conditions. So it had no diagnostic value,*  
50 *the ABCD2 score, but it's got some prognostic value in relation to high risk, low*  
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3 *risk stuff. So I think people are using it as a sort of diagnostic tool for TIA, that's*  
4 *how it's used inappropriately.*  
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7 Stroke consultant, 711  
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10 This concern about reliability, however, is most relevant if the ABCD2 proforma system  
11 is meant to serve exactly the same single purpose within both primary and secondary  
12 care. Secondary care users of the ABCD2 score emphasised the original intended use of  
13 the ABCD2 score (prognostication) more and discussed a greater number of negative  
14 alternate roles of the ABCD2 score (diagnostically confusing, obscuring the history, a  
15 barrier to appropriate care) versus primary care users of the ABCD2 score.  
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### 22 **ABCD2 non-users**

23 ~~As noted, none of the 12 patients were aware of the role of the ABCD2 proforma in the~~  
24 ~~management of their case, even though some GPs said they drew on it to explain and~~  
25 ~~stress urgency to patients. Thus, although the ABCD2 proforma is a significant tool for~~  
26 ~~many health professionals, it is probably not part of most patients' experience and does~~  
27 ~~not influence how they relate to their problem.~~ Our interviews ~~also~~ revealed that hospital  
28 staff not involved in triaging referrals - two radiographers and a nurse involved in  
29 scanning and caring for patients with TIA on a weekly basis - were ~~also~~ unaware of the  
30 ABCD2 score.  
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40 Similarly, a proportion of primary care staff interviewed also do not currently use the  
41 ABCD2 proforma (40%, n=4, three GPs and one A&E triage nurse). All cited lack of  
42 knowledge, but gave differing interpretations as to why this is so. One GP was  
43 "ashamed" but three interviewees felt they didn't use the score or proforma with good  
44 reason:  
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49 *I'm not familiar I have to say, but I think it would be mostly in my history*  
50 *already.*  
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54 Cambridgeshire GP, 801  
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3 *I don't think I was aware of it really, I imagine this is some sort of guideline*  
4 *system is it? ... you wouldn't believe how many guidelines there are.*

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6  
7 Cambridge GP, 901

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9  
10 *If you're going to use a scoring system it needs to be universal... everybody needs*  
11 *to be aware of it for it to be an effective tool.*

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13  
14 A&E triage nurse, 714

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16  
17 Overall our findings describe both the varied use of the form, and also the way it  
18 functions to provide a simple linkage between primary and secondary care. When the  
19 ABCD2 proforma is not adopted, GPs rely on methods such as referral letters and  
20 sending patients directly to A&E, communication and contact is largely one way and is  
21 not shaped by the expectations of secondary care.  
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## 28 **Discussion**

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30 Whilst it might be argued that this study is limited by the number of interviews  
31 conducted, it nevertheless is based on a commitment to capture as broad a set of views  
32 from relevant actors as possible. The choice to focus on just two centres of practice  
33 (Birmingham and Cambridge), brings the advantage of being able to elicit some specific  
34 and subtle descriptions but inevitably limits the generalisation of findings. Nevertheless,  
35 the overall argument concerning the multiple function of the ABCD2 score, and the  
36 adoption of protocols more generally, is robust given the general consistency of the data  
37 collected.  
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45 Our interviews with a range of health professionals clearly show that the apparently  
46 simple ABCD2 scoring system adopted within GP referral proformas serves a variety of  
47 different roles. We identified 13 functions, both positive and negative; of these, five were  
48 shared, four were specific to GPs, and four were specific to hospital staff. Whilst we are  
49 not claiming that the classification is definitive or exactly defined, this variety suggests  
50 that the proforma does not only standardise but can also sustain sufficient flexibility to  
51 serve a range of local purposes. This suggests that efforts to improve prognostic accuracy  
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3 of clinical prediction rules [Calvet et al 2009; Asimos et al 2009; Ay et al 2009; Giles et  
4 al 2010] should be accompanied by research and development of the other aspects of  
5 their usefulness.  
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10 Complex scientific fields such as medicine inevitably involve multiple domains of  
11 expertise, each of which has its own perspective and priorities that shapes the way things  
12 being studied are conceived and dealt with [Mol, 2002]. In order for pluralism across  
13 different subfields not to lead to fragmentation, there has to be what contemporary  
14 philosopher Hacking [1996] calls conceptual “unifiers” that span and integrate any  
15 discontinuities. In this vein, the notion of a “boundary object” describes those things,  
16 whether material or theoretical, that are both sufficiently stable to be treated as the same  
17 thing by different groups of scientists, and yet also flexible enough for them to operate  
18 and make sense with each of the different subfields [Leigh Star 2010].  
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27 In our study of the referral of suspected TIA patients from GP practices to the TIA clinic,  
28 one might have initially assumed that the “boundary object” is the patient, since she  
29 obviously moves from one site to another and apparently aligns primary and secondary  
30 services. However, our interviews reveal that the patient is not considered the chief  
31 means by which the two sites connect and establish a common point of reference, rather,  
32 it is the completed ABCD2 form.  
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39 Clinical prediction research needs to have a post-implementation phase in order to  
40 understand how the original research is used in practice, since this will determine its  
41 ultimate effect on processes of care and clinical outcomes. In current clinical practice,  
42 GPs could utilise a greater awareness of how clinical prediction rules practically function  
43 to improve referrals and referral pathways, and should consider communicating their  
44 significance to patients.  
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Possible questions to ask GP

1. (5) Why do you refer patients to the TIA clinic?
  - a. What things do you do before making a referral to the TIA clinic?
  - b. What criteria do you personally draw on in order to decide whether to refer or not?
  - c. Do you routinely use the ABCD2 score? How is it helpful?
  - d. How much do you say to patients and how much do you leave for the clinic?
2. How do you interact with patients who you suspect have had a TIA?
  - a. Are they well?
  - b. Are they ill?
3. NO QUESTION
4. Specifically for patients with suspected TIA, is continuity of care a significant issue?
  - a. i.e. is it important they see their "own" GP?
  - b. i.e. is it important they are seen at their regular practice rather than out of hours?
  - c. i.e. is it important they are seen at their regular practice rather than in A&E?
5. INCORPORATED INTO QUESTION 1
6. NO QUESTION
7. Do you feel patients have to wait long to be seen at the TIA clinic?
  - a. Does it make sense for patients to have different waiting times?
  - b. Are you aware of difficulties some patients have with waiting?
8. What do you think your role is when seeing patients with suspected TIA?
9. Could you tell me what your relationship with TIA clinic is like?
  - a. Are there particular people at the clinic that you have a working relationship with?
  - b. Where else might you send patients that you don't send to the TIA clinic?
10. Do you know what happens to patients when you refer them to the TIA clinic?
  - a. How do you normally hear back from the clinic?
11. What happens after the patient is discharged from the clinic?

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12. Do you currently ask some patients with suspected TIA to take any new medications or to do anything differently?
  13. We're interested in the differences between GP and hospital care for treating patients with suspected TIA.
    - a. Do you think there should be any change in the way things work between the GP and the hospital?
    - b. What do you think about the idea of changing things – perhaps having more of a role so that things might happen a little earlier?
    - c. What if you started patients on extra medications before they came to the hospital e.g. adding dipyridamol, a statin and aggressive BP control before they go to the hospital?
    - d. Can you see any problems or advantages with this?
  14. How comfortable are you with deciding a patient needs extra medications for a suspected TIA?
    - a. How do you feel about starting these before they've had any tests?
    - b. How comfortable are you with the TIA clinic starting a patient on life long medications based on their diagnosis of TIA?
  15. A future trial will be looking at improving treatment of TIA through getting GPs to prescribe extra medications for half the patients in the study.
    - a. Patients will be randomised to be given the new treatment or the current treatment – what's your feeling about this?
    - b. Whichever treatment is given, it would need to be given immediately – how much information should be given to patients?
    - c. Because quick treatment is crucial, it would be the GP who was helping the patient decide right there and then whether to take part in the research – what's your feeling about this?
    - d. Would you experience any dilemma in randomising the treatment of your patient?
    - e. The trial would require the GP to fill in a form, much like the current referral proforma, phone a telephone number (for the randomization), invite the patient to participate, and treat the patient. What is the best way of doing this?

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1. [5] Why are patients referred to the TIA clinic?
    - a. By whom are patients referred?
    - b. What are the reasons patients themselves attend the TIA clinic?
    - c. What things do referrers do before making a referral to the TIA clinic?
    - d. Do referrers routinely use the ABCD2 score? How is it helpful?
    - e. How much do GPs say to patients and how much do they leave for the clinic?
  2. How do you interact with patients who you suspect have had a TIA?
    - a. Are they well?
    - b. Are they ill?
  3. NO QUESTION
  4. Specifically for patients with suspected TIA, is continuity of care a significant issue?
    - a. i.e. is it important they see their “own” GP?
    - b. i.e. is it different if they are seen at their regular GP practice rather than in A&E?
  5. INCORPORATED INTO QUESTION 1 & 8
  6. NO QUESTION
  7. Do you feel patients have to wait long to be seen at the TIA clinic?
    - a. Does it make sense for patients to have different waiting times?
    - b. Are you aware of difficulties some patients have with waiting?
  8. What do you think your role is when seeing patients with suspected TIA?
  9. Do you work well together with GPs? How about A&E and other referrers?
  10. INCORPORATED INTO QUESTION 8
  11. What happens after the patient is discharged from the clinic?
  12. Do GPs currently ask some patients with suspected TIA to take any new medications or to do anything differently?
  13. We're interested in the differences between GP and hospital care for treating patients with suspected TIA.
    - a. Do you think there should be any change in the way things work between the GP and the hospital?
    - b. What do you think about the idea of changing things – perhaps giving GPs more of a role so that things might happen a little earlier?

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- c. What if GPs started patients on extra medications before they came to the hospital e.g. adding dipyridamole, a statin and aggressive BP control before they go to the hospital?
  - d. Can you see any problems or advantages with this?
14. How happy or comfortable are you with GPs deciding a patient needs extra medications for a suspected TIA?
- a. How do you feel about GPs starting these before they've had any tests?
  - b. How comfortable are you yourself in starting a patient on life long medications for a TIA?
15. A future study will be looking at improving treatment of TIA through getting GPs to prescribe extra medications for half the patients in the study.
- a. Patients will be randomised to be given the new treatment or the current treatment – what's your feeling about this?
  - b. Whichever treatment is given, it would need to be given immediately by the GP – how much information should be given to patients?
  - c. Because quick treatment is crucial, it would be the GP who was helping the patient decide right there and then whether to take part in the research – what's your feeling about this?

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3 Reviewer(s)' Comments to Author:  
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7 Reviewer: Dr Jenni Murray  
8 Leeds Institute of Health Sciences  
9 University of Leeds  
10

11 Further description of the analytic framework is required. THIS IS MENTIONED - THEMATIC ANALYSIS

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14 It is not clear what themes are being presented. UNCLEAR WHAT THIS COMMENT MEANS. WE HAVE ALLIGNED  
15 OUR METHODOLOGY WITH THEMATIC ANALYSIS AND AS DESCRIBED IN THE ANALYSIS SECTION OUR MAJOR  
16 OUTPUT FROM THIS WAS TO DEVELOP A DETAILED TYPOLOGY OF ROLES, PRESENTED IN TABLE 2.  
17

18  
19 It would be useful if the paper could give some background as to how the ABCD2 tool is used in clinical practice -  
20 does it for example improve the appropriateness of referrals to TIA clinics

21 A BRIEF SUMMARY IS PROVIDED IN PARAGRAPH 2 OF THE INTRODUCTION - THERE IS LIMITED RESEARCH AS TO  
22 THE EFFECTS ON PRACTICE OF PROFORMAS OR THE ABCD2 SCORE.  
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24  
25 The authors manuscript would benefit from closer adherence to for example the COREQ. A reporting tool for the  
26 reporting of qualitative studies. Information regarding how informed consent was obtained would be helpful  
27 WE HAVE ADDED FURTHER DETAILS AS PER THE COREQ CRITERIA. WE HAVE ALSO NOW PROVIDED QUESTION  
28 PROMPTS AS AN APPENDIX AND REMOVED ALL MENTION OF PATIENTS AS SUGGESTED (WE'D PREVIOUSLY HAD A  
29 "HALF-WAY HOUSE" WHERE THEY WERE MENTIONED BRIEFLY BUT INCOMPLETELY, WHICH HAS BEEN  
30 UNIVERSALLY OF-PUTTING TO REVIEWERS)  
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34  
35 Although the article is clearly written there are a few areas that the authors may wish to think about. Firstly the  
36 rationale for including patients in the study is unclear particularly as no real patient data is reported. This could be  
37 removed without detriment to the report. THANKS, AMENDED. The study reports on the usage of the ABCD2 but  
38 includes within the sample, clinical staff who do not use the tool. Additionally it seems a bit odd to include  
39 administrative staff. ADDED SOME EXPLANATION OF WHY THIS STAFF MEMBER WAS KEY AND HOW OUR  
40 SAMPLING METHODOLOGY LED TO HER If the study's aim was to explore how the tool was used it might have  
41 made more sense to have a selection criterion to reflect this. HOPEFULLY BETTER EXPLAINED NOW HOW OUR  
42 SNOWBALLING STRATEGY DID LEAD TO THIS. Table 2 presents the roles of the ABCD2. Actually some of these are  
43 consequences to using the tool rather than roles. WE ASSUME THIS MEANS THAT "ROLES" SUCH AS MEDICO-LEGAL  
44 THREAT ARE BETTER DESCRIBED AS CONSEQUENCES - THIS MAY BE MORE EXACT BUT WE WERE ALSO LOOKING  
45 FOR A SIMPLE TERM THAT CAPTURES ALL THE ROLES AND CONSEQUENCES OF THE ABCD2 PROFORMA AND FEEL  
46 "ROLES" DOES THIS BEST - BUT ALTERNATIVE SUGGESTIONS GRATEFULLY RECEIVED Finally as a boundary object  
47 the authors did not appear to explore how the ABCD2 helped to establish common ground between referrer and  
48 secondary care. GOOD POINT. MOST OF THE PAPER DEMONSTRATES THE DIFFERENT ROLES/CONSEQUENCES/USES  
49 OF THE ABCD2 PROFORMA IN DIFFERENT SETTINGS; THE COMMON GROUND IS LARGELY INFERRED BY THE FACT  
50 THAT THESE SITES ARE USING THE PROFORMA DESPITE THESE DIFFERENCES. HOWEVER THERE IS EVIDENCE IN  
51 QUOTES AND DESCRIPTION OF INTERVIEWS THAT MANY IN THE HOSPITAL ARE USING THE SCORE AS THEIR MAIN  
52 OBJECT TO TRIAGE AND MANAGE (AS OPPOSED TO THE PATIENT), AND THAT SOME GPs ARE FINDING IT EASIER TO  
53 COMMUNICATE AND ACHIEVE THEIR GOALS WITHIN THE HOSPITAL BY COMMUNICATED WITH THE ABCD2 SCORE  
54 AS OPPOSED TO THE PATIENT.  
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5 Reviewer: Velandai Srikanth, Associate Professor, Medicine, Monash University, Melbourne, Australia  
6

7 The sample is not representative of primary care. The message could be clearer MORE DETAILS OF THE SAMPLE  
8 HAVE BEEN PROVIDED. PATIENTS HAVE BEEN REMOVED FROM THE REPORT TO MAKE IT CLEARER.  
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10 The messages are not clear and discussion could be more comprehensive  
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12  
13 This is a qualitative study of the way the ABCD2 score is used in general practice, and how it is viewed by GPs,  
14 hospital specialists, medical staff, and patients. It was conducted in a region served by 2 hospitals in a small  
15 number of interviewees. A standardised proforma and detailed interviews were used although the details of these  
16 are a bit sketchy. PROVIDED AS APPENDIX. It was found that the score was viewed as being usable for several  
17 purposes in spite of being validated as a prognostic score for stroke risk. 60% of GPs and 100% of hospital  
18 specialists used the score. It was felt that the score served a frame of communication between care providers.  
19 Negative perceptions included the threat of medicolegal suit (if the score was not used).

20  
21 The study is small but this may not be unusual in in-depth qualitative research. I am however left wondering what  
22 principal messages one must take away from this paper.  
23

24 KEY MESSAGES ARE:

25 . The ABCD2 score is used in multiple ways beyond its original evidence-based purpose of risk stratification.

26 . Despite (or because) of its multiple differing uses by different clinicians, the ABCD2 score successfully facilitates  
27 communication across clinical domains as a "boundary object."  
28

29 . Clinical prediction rules which have become boundary objects within referral pathways could become an  
30 important mechanism to improve patient care.  
31

32 My perception of the score is that it is not a very reliable prognostic tool in the best of hands. GILES ET AL  
33 REFERENCE ADDED TO INTRO TO DEMONSTRATE THIS IS NOT THE CONSENSUS VIEW Do we surmise that it is a  
34 good thing to use the score and for what purpose (knowing that there is increasing evidence that it is really not a  
35 very good prognostic tool), or does one just surmise that it is good to have a common "communication tool" even  
36 though it may not do its primary intended job very well? It is good to conduct post-implementation research, but a  
37 purely qualitative survey of how it is used and perceptions about it may not quite be sufficient to advise the reader  
38 about the score's advantages and faults. At best, to achieve a balance, there may need to be more discussion of  
39 whether the negative perceptions (eg medico-legal threat - if the score is, or is not used) may have some basis, and  
40 whether or not one should be satisfied with a relatively poor prognostic score being used as a common frame of  
41 communication just by virtue of being a score, rather than actually serving patient care  
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**Varying uses of the ABCD2 scoring system in primary and secondary care: a qualitative study**

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51  
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53 DE, SC, NM, SM and JM developed the original idea and protocol. DE, SC, NM and SV  
54 conducted the interviews. DE and SC led the qualitative analysis and drafted the paper.  
55 DE, SC, NM, SV, DL, SM, MG, RM and JM contributed to the writing of the final  
56 version of the paper. DE is the guarantor.  
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Participants gave informed consent for transcripts to be used in research provided that quotes are anonymised and information used in reports could not lead to identification.

**ABSTRACT**

**Objectives:** To explore the usage of the ABCD2 risk stratification score by general practitioners and hospital staff during the referral of patients with suspected transient ischaemic attack (TIA) or minor stroke.

**Design:** Qualitative study using semi-structured interviews.

**Setting:** Nine general practices and two hospital sites in England (Birmingham and Cambridge).

**Participants:** Nine general practitioners, nine hospital staff (two consultants, four nurses, two ultrasonographers and one administrator), ~~and 12 patients with recently suspected transient ischaemic attack or minor stroke (within the previous three months).~~

**Results:** In both sites, clinicians used a referral proforma based around the ABCD2 scoring system for a range of purposes including self-education, to assist emphasising urgency to the patient, as a referral pathway facilitator and as a diagnostic tool. Negative views of its role included potential medico-legal threat, that it was a barrier to appropriate care, and led to mis-diagnosis. Despite having differing uses by different clinicians, the ABCD2 proforma was the central means of inter-professional communication in TIA referrals across both sites. ~~No patients were aware of their ABCD2 score.~~

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**Conclusions:** Understanding how prediction rules are used in practice is key to determining their impact on processes of care and clinical outcomes. In practice, GPs and their colleagues use the ABCD2 score in subtly different ways and it functions as a “boundary object” by both accommodating these multiple purposes, yet still successfully aiding communication between them.

For peer review only

## Introduction

The ABCD2 score is a clinical prediction rule developed in 2007 to predict the risk of recurrent stroke soon after transient ischaemic attack (TIA) [Johnston et al 2007; [Giles et al 2010](#)]. The score has rapidly become an integral part of the referral process for TIA internationally [NICE 2008; RCP 2010; Easton et al 2009; National Stroke Foundation 2008; Stroke Foundation of New Zealand 2008] and often forms part of a “proforma” – a form which integrates standardised protocols and frequently clinical prediction rules – for referrals to secondary care. Such proformas are increasingly common for primary to secondary care communication: in April 2011 Addenbrookes Hospital in Cambridge, UK, requested the use of a proforma for 48 conditions ranging from early inflammatory arthritis to suspected renal colic.

Despite the increasing use of proformas, there is only limited research into their use or impact [Akbari et al 2008]. For example, the ABCD2 score was derived and validated in secondary care as a prognostic score, yet the UK’s National Institute for Health and Clinical Excellence [NICE 2008] recommends its use in all referrals of suspected TIA by General Practitioners (GPs) and accident and emergency (A&E) departments despite evidence of substantial disagreement between specialist and generalist scores [Kinsella et al 2011 and Wong et al 2012]. We studied the ABCD2 score’s use across different parts of the health service in order to analyse how the score and its associated proforma are used in everyday clinical practice.

### Box 1: Description of the ABCD2 clinical prediction rule for stroke risk after TIA

Age $\geq$ 60	1 point
Blood Pressure $\geq$ 140/90 mmHg at acute evaluation	1 point
Clinical features	1 point for speech disturbance without weakness; 2 points for unilateral weakness
Duration	1 point for 10-59 minutes, 2 points for $\geq$ 60 minutes
Diabetes	1 point
Patients scoring 4 or more points are deemed high risk. [NICE 2008]	

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Our theoretical background comes from an area of social science research that looks at the increasing role of forms and other systems of standardisation in medical practice. Although protocols are frequently criticised because they constrain and dictate practice, rendering individual decision-making redundant, Timmermans and Berg [1997] argue that this criticism is misplaced. Rather, an inherent aspect of any useful protocol is that it can accommodate local deviation. Individuals invariably ‘tinker’ with them, whilst ensuring they are not undermined, such that they are workable for each specific circumstance. As a result, a protocol often becomes what has been termed a ‘boundary object’ [Leigh Star 2010]. This term refers to any item or procedure that is sufficiently standardised to ensure a common meaning or action is established across different specialist fields, yet also is sufficiently flexible to allow for adaptation to make it useful and meaningful in local contexts. As a result, though there may well be significant differences between various locations or areas of expertise, boundary objects serve to provide common ground, and are thus a way of establishing overall coherence and integration.

## Methods

### Participants and procedures

This study was a prelude to a randomised controlled trial of a novel method for stroke prevention in primary care. Participants were recruited from two locations (Cambridgeshire/Addenbrookes hospital and West Midlands/Queen Elizabeth hospital) to permit exploration of variation between sites. The TIA clinics in both areas had independently created proformas which they requested be completed for all referrals, in which the ABCD2 score was central.

Eligible GPs had to be within the catchment area of Addenbrooke’s or Queen Elizabeth hospital TIA clinic while staff members included any within these hospitals who regularly encountered patients with suspected TIA. GPs were approached by e-mail using the mailing lists of local research networks with one sampling criteria, that there should be a mix of GPs from Birmingham and Cambridgeshire (these GPs had an obligation and/or interest in participating in research generally, and so this convenience sampling

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~~method greatly increased our response rate and reduced the chance of exclusively recruiting stroke enthusiasts rather than being stroke research enthusiasts), and all nine of ten volunteer GPs with whom we could arrange interviews contacted were interviewed: in total we interviewed six Cambridgeshire GPs and three Birmingham GPs. We identified our sample of secondary care informants by adopting a “easeade-snowball method”, starting with a consultant interview at each site and then progressively identifying key players in the TIA referral process: based on discussing in depth with each interviewee with whom they had significantly liaised. As a result we identified a cross section of staff we might otherwise have missed involved in many potential TIA management pathways. Interviewees were approached by e-mail, telephone or in person, often with the assistance of the previous interviewee; all approached interviewees consented to interview: in total we interviewed six Cambridgeshire GPs and three Birmingham GPs; two stroke consultants; three stroke nurses; two ultrasonographers involved in assessing TIA patients; one stroke team administrator (who liaised with patients, GPs and ensured ABCD2 score proformas were actioned) and one A&E triaging nurse. Five of the hospital staff came from Queen Elizabeth Hospital and four from Addenbrookes, with an equal number of doctors (one) and nurses (two) from each site.~~

~~In addition, twelve patients were interviewed in their homes within 3 months of being seen in the Addenbrookes or Queen Elizabeth hospital clinic with a suspected TIA. Of these, seven had had a TIA or minor stroke diagnosis confirmed.~~

### Interviews

Face-to-face interviews followed a topic guide generated by the research team that was initially piloted. The focus was not specifically on the ABCD2 form, but rather to establish a qualitative understanding of experiences along the pathway from GP consultation to TIA clinic referral, inviting professionals to draw on past cases they had referred or been referred. ~~A set of interviews with patients was also conducted; these form a very limited part of our analysis here as in all twelve cases they were unaware of the ABCD2 score or its role in their referral. Written consent was confirmed prior to~~

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3 | interview, and iInterviews lasted on average one hour. They were audio-recorded and  
4 then transcribed verbatim by a professional transcription service. DE, NM (both GPs), SC  
5 (medical anthropologist), and SV (qualitative researcher) conducted the interviews at the  
6 hospital site (hospital staff members) or, at the GP's practice (GPs) ~~or at the patient's~~  
7 ~~home~~. The interviewer checked the full transcription against the audio-recording for  
8 accuracy. Question prompts are provided as an appendix.  
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### 14 15 16 **Analysis**

17 DE, SC and NM read through the transcripts and established central themes that were  
18 raised. An initial sample of transcripts was coded independently by DE and SC (using  
19 NVivo) to ensure reliability and to revise codes where necessary. Subsequent themes that  
20 emerged as these were applied to the remaining transcripts were always discussed within  
21 the team, and if adopted, coded across the entire dataset.  
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28 It was clear that much discussion regarding suspected TIAs - when it was appropriate to  
29 refer, whether they should be considered urgent cases, and possible patient pathways that  
30 could be followed - centred on the current use of the ABCD2 proforma. This was  
31 therefore identified as a pivotal issue that would serve to capture many of the more  
32 general comments made, and provide a specific focus to explore how a suspected TIA is  
33 negotiated in referral pathways. As a result, DE and SC undertook further analysis of the  
34 transcripts; any direct or indirect mention of the ABCD2 scoring system, or practical use  
35 of a proforma in the referral pathway, was consequently noted in every transcript in a  
36 thematic analysis. Further coding allowed a detailed typology of varying roles associated  
37 with the ABCD2 score and the proforma itself (if used); this included both positive and  
38 negative features of its use.  
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### 49 **Results**

50 | Nine GPs ~~, twelve patients,~~ and nine hospital staff took part in the study (see Table 1 for  
51 interviewee characteristics).  
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#### 56 **Table 1: Interviewee characteristics**

Role	Use the ABCD2 score?
GP, Cambridgeshire	yes
GP, Cambridgeshire	no
GP, West Midlands	yes
Consultant	yes
Stroke specialist nurse	yes
Stroke staff nurse	no
A&E department triage nurse	no
Ultrasonographer	no
Clinic administrator	yes
<b>Six Cambridgeshire patients</b>	<b>no</b>
<b>Six West Midlands patients</b>	<b>no</b>

### **Awareness of ABCD2 amongst patients**

~~Although many of the patients spontaneously mentioned the FAST campaign<sup>12</sup>, none were aware that there was a system that calculated their risk of having a stroke after a suspected TIA, or that there was a related form that their GP might have used to assist making a referral. This finding is of particular interest in light of the significance the score is given by some GPs and hospital staff.~~

### **Use of ABCD2 amongst health professionals**

Even though a relatively small sample of GPs and secondary care staff who use the score were interviewed, a surprising variety of different uses for the proforma/ABCD2 score were described (See Tables 2 and 3).

**Table 2: Roles of the ABCD2 proforma with exemplar quotes**

1.	<b>Might generate medico-legal threat</b>	“You might have to justify in the future why you haven’t followed a guideline” (901, Cambridgeshire GP)
2.	<b>Demonstrates need for urgency to patient</b>	“it sometimes provokes a little bit of alarm” (701, Cambridgeshire GP)
3.	<b>Educates the patient</b>	“when things have sometimes had the hospital stamp of approval, it’s easier to explain things, so they see a clear-cut pathway



		basically” (702, Cambridgeshire GP)
4.	<b>Diagnostic tool</b>	“you’ve got the tick box, it helps define what is a TIA and that score thing is very helpful” (605, Birmingham GP)
5.	<b>Prognostic tool</b>	“a lower score makes it okay to send it to the next TIA clinic and a higher score you send it urgently” (702, Cambridgeshire GP)
6.	<b>Demonstrates need for urgency to the GP</b>	“It didn’t feel right to send somebody to hospital very urgently who seems perfectly alright... Having the score there sort of gives you a bit of confidence to do just that” (703, Cambridgeshire GP)
7.	<b>Facilitates smoother patient pathway</b>	“It’s just simpler because we know what they need and it’s a way of getting it” (610, Birmingham GP)
8.	<b>Educates/reminds the GP what to do</b>	“I usually dig it out if I’m thinking to refer somebody to that clinic just to remind myself... it’s always useful to have something in front of you” (605, Birmingham GP)
9.	<b>Distils a complex history</b>	“you simply go ‘Okay, you fit a number, you need to go in, we need to refer you, there’s a degree of urgency’” (701, Cambridgeshire GP)
10.	<b>Obscures a complex history</b>	“You get an idea from the actual GP, the history and what the patient’s told you more than you can from the score really” (606, specialist nurse)
11.	<b>Misleading GPs about diagnosis</b>	“If you start from the right places, that this was a TIA, it’s fine, but as I say, just because you’re 80, you’ve got diabetes and hypertension, you automatically score three... so it has no diagnostic value, the ABCD2 score” (711, consultant)
12.	<b>Prevents inappropriate referrals</b>	“Some GPs lie to get them into clinic. Not so much now that we’ve changed the pro forma” (710, specialist nurse)
13.	<b>Barrier to appropriate care</b>	“Our vision... would be to have a TIA hotline... and using that system I wouldn’t bother using the ABCD2 score” (602, consultant)

**Table 3: Comparing roles of the ABCD2 score by GPs and by hospital staff**

	<b>Primary care staff (nine GPs &amp; one A&amp;E triage nurse)</b>	<b>Specialist doctors, nurses &amp; administrator</b>	<b>Hospital support staff (technicians &amp; staff nurse)</b>
<b>Never use the score</b>	<b>40% (n=4)</b>		<b>100% (n=3)</b>
<b>Do use the score</b>	<b>60% (n=6)</b>	<b>100% (n=5)</b>	

Might generate medico-legal threat	X	
Demonstrates need for urgency to patient	X	
Educates the patient	X	
Diagnostic tool	X	
Prognostic tool	X	X
Demonstrates need for urgency to the GP	X	X
Facilitates smoother patient pathway	X	X
Educates/reminds the GP what to do	X	X
Distils a complex history	X	X
Obscures a complex history		X
Misleading GPs about diagnosis		X
Prevents inappropriate referrals		X
Barrier to appropriate care		X
Note: X indicates this theme was raised by at least one of the participants of the sub-group		

### Use of the ABCD2 in general practice

For those GPs who use the scoring system, it was clear that they both liked and complied with its use as it offers a tangible means to navigate the referral system. Most did not ever consider their scoring as inaccurate. However, they primarily regard it as the key mechanism to access services on behalf of a patient, at which point a more definitive diagnosis be made based on specialist expertise and technological procedures:

*It was just a case of looking, getting the score and then speaking to the medical liaison sister.... I think it's quite useful, I really quite like that scoring system because it does give you a bit of confidence about what to do, because otherwise it can be a bit nebulous.*

Cambridgeshire GP, 703

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5 GPs described how they didn't feel the need to make a definitive diagnosis, but rather  
6 used the form to defer this to the hospital. Thus, the scoring system serves as a tool to  
7 systematise their evaluation of a patient within their consultation, yet also ensures a  
8 referral to secondary care happens swiftly.  
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14 When completing the form, GPs consider potentially relevant patient history to be a  
15 broad category. Beyond the specific clinical focus that might relate to a suspected TIA,  
16 many express how they cannot simply ignore a wide range of other factors that might  
17 possibly be central to the patients' current health status. These aspects, which are not part  
18 of the scoring system, can consequently influence how scores are eventually arrived at as  
19 GPs try to assess what the consequence of an overall score is likely to be:  
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26 *Obviously each patient's not the same, so sometimes you do need a little bit of*  
27 *adaption.*  
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30 Birmingham GP, 608  
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34 GPs also adapted their own management in response to the form, for example using it to  
35 remind them about TIAs, to educate the patient, or to persuade patients that the problem  
36 was urgent and that referral needed to be carried out urgently.  
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39

#### 40 **The ABCD2 use by hospital staff**

41  
42 Hospital staff viewed the score more restrictively as a reliable record of the clinical event  
43 itself. As a result, they sometimes view the GPs approach as problematic or even  
44 careless, since it leads to what they view as inaccuracies and inappropriate referrals:  
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48

49 *If we all did what we're meant to, it would be great*  
50  
51

52 Stroke consultant, 711  
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55 Unlike the GPs, who view the score within their own consultations as a checklist to  
56 ensure sufficient scope of questioning and externally as a mechanism to justify referral,  
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3 staff in the hospital see the score as ideally an objective evaluation of severity of  
4 prognosis.  
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9 *Our protocol I think it is quite clear... it's about a three or four page*  
10 *document, it gives them [GPs] advice on which medications to start, how*  
11 *to administer the ABCD2 score, and then lots of ways for different people.*

12  
13  
14 Stroke consultant 711  
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16  
17 As a natural consequence of this perspective, patients who, it turns out, have not had  
18 TIAs but satisfied the scoring to some degree are said to “mimic” genuine TIA patients  
19 according to the criteria set out in the ABCD2 form:  
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24 *We get so many mimics referred to the clinic, making sure you're dealing with the*  
25 *right diagnosis is probably the first issue.*  
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28 Specialist nurse, 602  
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31 Various negative terms including “uneducated”, “inappropriate”, “challenging” and  
32 “dubious” are also used to describe referrals or patients in similar circumstances.  
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37 Many of the interviews with hospital staff acknowledged that a GP or emergency doctor  
38 may “misbehave” or “use [the TIA clinic] as a place to send patients they don't know  
39 what to do with” and refer patients that they know cannot be a “genuine” TIA. The  
40 ABCD2 score is also seen as potentially misleading when used inappropriately:  
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45 *I think we would say if you start from the right place, the ABCD2 scores would*  
46 *discriminate between the high risk and the low risk and people who need urgent*  
47 *and maybe less urgent investigations, but... a lot of people that we see in the*  
48 *clinic I'd imagine their age is probably somewhere in their 80s, then they*  
49 *inappropriately score high than other conditions. So it had no diagnostic value,*  
50 *the ABCD2 score, but it's got some prognostic value in relation to high risk, low*  
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3 *risk stuff. So I think people are using it as a sort of diagnostic tool for TIA, that's*  
4 *how it's used inappropriately.*  
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6

7 Stroke consultant, 711  
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9

10 This concern about reliability, however, is most relevant if the ABCD2 proforma system  
11 is meant to serve exactly the same single purpose within both primary and secondary  
12 care. Secondary care users of the ABCD2 score emphasised the original intended use of  
13 the ABCD2 score (prognostication) more and discussed a greater number of negative  
14 alternate roles of the ABCD2 score (diagnostically confusing, obscuring the history, a  
15 barrier to appropriate care) versus primary care users of the ABCD2 score.  
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### 22 **ABCD2 non-users**

23 ~~As noted, none of the 12 patients were aware of the role of the ABCD2 proforma in the~~  
24 ~~management of their case, even though some GPs said they drew on it to explain and~~  
25 ~~stress urgency to patients. Thus, although the ABCD2 proforma is a significant tool for~~  
26 ~~many health professionals, it is probably not part of most patients' experience and does~~  
27 ~~not influence how they relate to their problem.~~ Our interviews ~~also~~ revealed that hospital  
28 staff not involved in triaging referrals - two radiographers and a nurse involved in  
29 scanning and caring for patients with TIA on a weekly basis - were ~~also~~ unaware of the  
30 ABCD2 score.  
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40 Similarly, a proportion of primary care staff interviewed also do not currently use the  
41 ABCD2 proforma (40%, n=4, three GPs and one A&E triage nurse). All cited lack of  
42 knowledge, but gave differing interpretations as to why this is so. One GP was  
43 "ashamed" but three interviewees felt they didn't use the score or proforma with good  
44 reason:  
45  
46  
47  
48

49 *I'm not familiar I have to say, but I think it would be mostly in my history*  
50 *already.*  
51  
52  
53

54 Cambridgeshire GP, 801  
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3 *I don't think I was aware of it really, I imagine this is some sort of guideline*  
4 *system is it? ... you wouldn't believe how many guidelines there are.*

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6  
7 Cambridge GP, 901

8  
9  
10 *If you're going to use a scoring system it needs to be universal... everybody needs*  
11 *to be aware of it for it to be an effective tool.*

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13  
14 A&E triage nurse, 714

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16  
17 Overall our findings describe both the varied use of the form, and also the way it  
18 functions to provide a simple linkage between primary and secondary care. When the  
19 ABCD2 proforma is not adopted, GPs rely on methods such as referral letters and  
20 sending patients directly to A&E, communication and contact is largely one way and is  
21 not shaped by the expectations of secondary care.  
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## 27 28 **Discussion**

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30 Whilst it might be argued that this study is limited by the number of interviews  
31 conducted, it nevertheless is based on a commitment to capture as broad a set of views  
32 from relevant actors as possible. The choice to focus on just two centres of practice  
33 (Birmingham and Cambridge), brings the advantage of being able to elicit some specific  
34 and subtle descriptions but inevitably limits the generalisation of findings. Nevertheless,  
35 the overall argument concerning the multiple function of the ABCD2 score, and the  
36 adoption of protocols more generally, is robust given the general consistency of the data  
37 collected.  
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45 Our interviews with a range of health professionals clearly show that the apparently  
46 simple ABCD2 scoring system adopted within GP referral proformas serves a variety of  
47 different roles. We identified 13 functions, both positive and negative; of these, five were  
48 shared, four were specific to GPs, and four were specific to hospital staff. Whilst we are  
49 not claiming that the classification is definitive or exactly defined, this variety suggests  
50 that the proforma does not only standardise but can also sustain sufficient flexibility to  
51 serve a range of local purposes. This suggests that efforts to improve prognostic accuracy  
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3 of clinical prediction rules [Calvet et al 2009; Asimos et al 2009; Ay et al 2009; Giles et  
4 al 2010] should be accompanied by research and development of the other aspects of  
5 their usefulness.  
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10 Complex scientific fields such as medicine inevitably involve multiple domains of  
11 expertise, each of which has its own perspective and priorities that shapes the way things  
12 being studied are conceived and dealt with [Mol, 2002]. In order for pluralism across  
13 different subfields not to lead to fragmentation, there has to be what contemporary  
14 philosopher Hacking [1996] calls conceptual “unifiers” that span and integrate any  
15 discontinuities. In this vein, the notion of a “boundary object” describes those things,  
16 whether material or theoretical, that are both sufficiently stable to be treated as the same  
17 thing by different groups of scientists, and yet also flexible enough for them to operate  
18 and make sense with each of the different subfields [Leigh Star 2010].  
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27 In our study of the referral of suspected TIA patients from GP practices to the TIA clinic,  
28 one might have initially assumed that the “boundary object” is the patient, since she  
29 obviously moves from one site to another and apparently aligns primary and secondary  
30 services. However, our interviews reveal that the patient is not considered the chief  
31 means by which the two sites connect and establish a common point of reference, rather,  
32 it is the completed ABCD2 form.  
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39 Clinical prediction research needs to have a post-implementation phase in order to  
40 understand how the original research is used in practice, since this will determine its  
41 ultimate effect on processes of care and clinical outcomes. In current clinical practice,  
42 GPs could utilise a greater awareness of how clinical prediction rules practically function  
43 to improve referrals and referral pathways, and should consider communicating their  
44 significance to patients.  
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Possible questions to ask GP

1. (5) Why do you refer patients to the TIA clinic?
  - a. What things do you do before making a referral to the TIA clinic?
  - b. What criteria do you personally draw on in order to decide whether to refer or not?
  - c. Do you routinely use the ABCD2 score? How is it helpful?
  - d. How much do you say to patients and how much do you leave for the clinic?
2. How do you interact with patients who you suspect have had a TIA?
  - a. Are they well?
  - b. Are they ill?
3. NO QUESTION
4. Specifically for patients with suspected TIA, is continuity of care a significant issue?
  - a. i.e. is it important they see their "own" GP?
  - b. i.e. is it important they are seen at their regular practice rather than out of hours?
  - c. i.e. is it important they are seen at their regular practice rather than in A&E?
5. INCORPORATED INTO QUESTION 1
6. NO QUESTION
7. Do you feel patients have to wait long to be seen at the TIA clinic?
  - a. Does it make sense for patients to have different waiting times?
  - b. Are you aware of difficulties some patients have with waiting?
8. What do you think your role is when seeing patients with suspected TIA?
9. Could you tell me what your relationship with TIA clinic is like?
  - a. Are there particular people at the clinic that you have a working relationship with?
  - b. Where else might you send patients that you don't send to the TIA clinic?
10. Do you know what happens to patients when you refer them to the TIA clinic?
  - a. How do you normally hear back from the clinic?
11. What happens after the patient is discharged from the clinic?

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12. Do you currently ask some patients with suspected TIA to take any new medications or to do anything differently?
  13. We're interested in the differences between GP and hospital care for treating patients with suspected TIA.
    - a. Do you think there should be any change in the way things work between the GP and the hospital?
    - b. What do you think about the idea of changing things – perhaps having more of a role so that things might happen a little earlier?
    - c. What if you started patients on extra medications before they came to the hospital e.g. adding dipyridamol, a statin and aggressive BP control before they go to the hospital?
    - d. Can you see any problems or advantages with this?
  14. How comfortable are you with deciding a patient needs extra medications for a suspected TIA?
    - a. How do you feel about starting these before they've had any tests?
    - b. How comfortable are you with the TIA clinic starting a patient on life long medications based on their diagnosis of TIA?
  15. A future trial will be looking at improving treatment of TIA through getting GPs to prescribe extra medications for half the patients in the study.
    - a. Patients will be randomised to be given the new treatment or the current treatment – what's your feeling about this?
    - b. Whichever treatment is given, it would need to be given immediately – how much information should be given to patients?
    - c. Because quick treatment is crucial, it would be the GP who was helping the patient decide right there and then whether to take part in the research – what's your feeling about this?
    - d. Would you experience any dilemma in randomising the treatment of your patient?
    - e. The trial would require the GP to fill in a form, much like the current referral proforma, phone a telephone number (for the randomization), invite the patient to participate, and treat the patient. What is the best way of doing this?

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1. [5] Why are patients referred to the TIA clinic?
    - a. By whom are patients referred?
    - b. What are the reasons patients themselves attend the TIA clinic?
    - c. What things do referrers do before making a referral to the TIA clinic?
    - d. Do referrers routinely use the ABCD2 score? How is it helpful?
    - e. How much do GPs say to patients and how much do they leave for the clinic?
  2. How do you interact with patients who you suspect have had a TIA?
    - a. Are they well?
    - b. Are they ill?
  3. NO QUESTION
  4. Specifically for patients with suspected TIA, is continuity of care a significant issue?
    - a. i.e. is it important they see their “own” GP?
    - b. i.e. is it different if they are seen at their regular GP practice rather than in A&E?
  5. INCORPORATED INTO QUESTION 1 & 8
  6. NO QUESTION
  7. Do you feel patients have to wait long to be seen at the TIA clinic?
    - a. Does it make sense for patients to have different waiting times?
    - b. Are you aware of difficulties some patients have with waiting?
  8. What do you think your role is when seeing patients with suspected TIA?
  9. Do you work well together with GPs? How about A&E and other referrers?
  10. INCORPORATED INTO QUESTION 8
  11. What happens after the patient is discharged from the clinic?
  12. Do GPs currently ask some patients with suspected TIA to take any new medications or to do anything differently?
  13. We're interested in the differences between GP and hospital care for treating patients with suspected TIA.
    - a. Do you think there should be any change in the way things work between the GP and the hospital?
    - b. What do you think about the idea of changing things – perhaps giving GPs more of a role so that things might happen a little earlier?

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- c. What if GPs started patients on extra medications before they came to the hospital e.g. adding dipyradamole, a statin and aggressive BP control before they go to the hospital?
  - d. Can you see any problems or advantages with this?
14. How happy or comfortable are you with GPs deciding a patient needs extra medications for a suspected TIA?
- a. How do you feel about GPs starting these before they've had any tests?
  - b. How comfortable are you yourself in starting a patient on life long medications for a TIA?
15. A future study will be looking at improving treatment of TIA through getting GPs to prescribe extra medications for half the patients in the study.
- a. Patients will be randomised to be given the new treatment or the current treatment – what's your feeling about this?
  - b. Whichever treatment is given, it would need to be given immediately by the GP – how much information should be given to patients?
  - c. Because quick treatment is crucial, it would be the GP who was helping the patient decide right there and then whether to take part in the research – what's your feeling about this?

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3 Reviewer(s)' Comments to Author:  
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6

7 Reviewer: Dr Jenni Murray  
8 Leeds Institute of Health Sciences  
9 University of Leeds  
10

11 Further description of the analytic framework is required. THIS IS MENTIONED - THEMATIC ANALYSIS

12  
13  
14 It is not clear what themes are being presented. UNCLEAR WHAT THIS COMMENT MEANS. WE HAVE ALLIGNED  
15 OUR METHODOLOGY WITH THEMATIC ANALYSIS AND AS DESCRIBED IN THE ANALYSIS SECTION OUR MAJOR  
16 OUTPUT FROM THIS WAS TO DEVELOP A DETAILED TYPOLOGY OF ROLES, PRESENTED IN TABLE 2.  
17  
18

19 It would be useful if the paper could give some background as to how the ABCD2 tool is used in clinical practice -  
20 does it for example improve the appropriateness of referrals to TIA clinics

21 A BRIEF SUMMARY IS PROVIDED IN PARAGRAPH 2 OF THE INTRODUCTION - THERE IS LIMITED RESEARCH AS TO  
22 THE EFFECTS ON PRACTICE OF PROFORMAS OR THE ABCD2 SCORE.  
23  
24

25 The authors manuscript would benefit from closer adherence to for example the COREQ. A reporting tool for the  
26 reporting of qualitative studies. Information regarding how informed consent was obtained would be helpful  
27 WE HAVE ADDED FURTHER DETAILS AS PER THE COREQ CRITERIA. WE HAVE ALSO NOW PROVIDED QUESTION  
28 PROMPTS AS AN APPENDIX AND REMOVED ALL MENTION OF PATIENTS AS SUGGESTED (WE'D PREVIOUSLY HAD A  
29 "HALF-WAY HOUSE" WHERE THEY WERE MENTIONED BRIEFLY BUT INCOMPLETELY, WHICH HAS BEEN  
30 UNIVERSALLY OF-PUTTING TO REVIEWERS)  
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34 Although the article is clearly written there are a few areas that the authors may wish to think about. Firstly the  
35 rationale for including patients in the study is unclear particularly as no real patient data is reported. This could be  
36 removed without detriment to the report. THANKS, AMENDED. The study reports on the usage of the ABCD2 but  
37 includes within the sample, clinical staff who do not use the tool. Additionally it seems a bit odd to include  
38 administrative staff. ADDED SOME EXPLANATION OF WHY THIS STAFF MEMBER WAS KEY AND HOW OUR  
39 SAMPLING METHODOLOGY LED TO HER If the study's aim was to explore how the tool was used it might have  
40 made more sense to have a selection criterion to reflect this. HOPEFULLY BETTER EXPLAINED NOW HOW OUR  
41 SNOWBALLING STRATEGY DID LEAD TO THIS. Table 2 presents the roles of the ABCD2. Actually some of these are  
42 consequences to using the tool rather than roles. WE ASSUME THIS MEANS THAT "ROLES" SUCH AS MEDICO-LEGAL  
43 THREAT ARE BETTER DESCRIBED AS CONSEQUENCES - THIS MAY BE MORE EXACT BUT WE WERE ALSO LOOKING  
44 FOR A SIMPLE TERM THAT CAPTURES ALL THE ROLES AND CONSEQUENCES OF THE ABCD2 PROFORMA AND FEEL  
45 "ROLES" DOES THIS BEST - BUT ALTERNATIVE SUGGESTIONS GRATEFULLY RECEIVED Finally as a boundary object  
46 the authors did not appear to explore how the ABCD2 helped to establish common ground between referrer and  
47 secondary care. GOOD POINT. MOST OF THE PAPER DEMONSTRATES THE DIFFERENT ROLES/CONSEQUENCES/USES  
48 OF THE ABCD2 PROFORMA IN DIFFERENT SETTINGS; THE COMMON GROUND IS LARGELY INFERRED BY THE FACT  
49 THAT THESE SITES ARE USING THE PROFORMA DESPITE THESE DIFFERENCES. HOWEVER THERE IS EVIDENCE IN  
50 QUOTES AND DESCRIPTION OF INTERVIEWS THAT MANY IN THE HOSPITAL ARE USING THE SCORE AS THEIR MAIN  
51 OBJECT TO TRIAGE AND MANAGE (AS OPPOSED TO THE PATIENT), AND THAT SOME GPs ARE FINDING IT EASIER TO  
52 COMMUNICATE AND ACHIEVE THEIR GOALS WITHIN THE HOSPITAL BY COMMUNICATED WITH THE ABCD2 SCORE  
53 AS OPPOSED TO THE PATIENT.  
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5 Reviewer: Velandai Srikanth, Associate Professor, Medicine, Monash University, Melbourne, Australia  
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7 The sample is not representative of primary care. The message could be clearer MORE DETAILS OF THE SAMPLE  
8 HAVE BEEN PROVIDED. PATIENTS HAVE BEEN REMOVED FROM THE REPORT TO MAKE IT CLEARER.  
9

10 The messages are not clear and discussion could be more comprehensive  
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12  
13 This is a qualitative study of the way the ABCD2 score is used in general practice, and how it is viewed by GPs,  
14 hospital specialists, medical staff, and patients. It was conducted in a region served by 2 hospitals in a small  
15 number of interviewees. A standardised proforma and detailed interviews were used although the details of these  
16 are a bit sketchy. PROVIDED AS APPENDIX. It was found that the score was viewed as being usable for several  
17 purposes in spite of being validated as a prognostic score for stroke risk. 60% of GPs and 100% of hospital  
18 specialists used the score. It was felt that the score served a frame of communication between care providers.  
19 Negative perceptions included the threat of medicolegal suit (if the score was not used).

20  
21 The study is small but this may not be unusual in in-depth qualitative research. I am however left wondering what  
22 principal messages one must take away from this paper.  
23

24 KEY MESSAGES ARE:

25 . The ABCD2 score is used in multiple ways beyond its original evidence-based purpose of risk stratification.

26 . Despite (or because) of its multiple differing uses by different clinicians, the ABCD2 score successfully facilitates  
27 communication across clinical domains as a "boundary object."  
28

29 . Clinical prediction rules which have become boundary objects within referral pathways could become an  
30 important mechanism to improve patient care.  
31

32 My perception of the score is that it is not a very reliable prognostic tool in the best of hands. GILES ET AL  
33 REFERENCE ADDED TO INTRO TO DEMONSTRATE THIS IS NOT THE CONSENSUS VIEW Do we surmise that it is a  
34 good thing to use the score and for what purpose (knowing that there is increasing evidence that it is really not a  
35 very good prognostic tool), or does one just surmise that it is good to have a common "communication tool" even  
36 though it may not do its primary intended job very well? It is good to conduct post-implementation research, but a  
37 purely qualitative survey of how it is used and perceptions about it may not quite be sufficient to advise the reader  
38 about the score's advantages and faults. At best, to achieve a balance, there may need to be more discussion of  
39 whether the negative perceptions (eg medico-legal threat - if the score is, or is not used) may have some basis, and  
40 whether or not one should be satisfied with a relatively poor prognostic score being used as a common frame of  
41 communication just by virtue of being a score, rather than actually serving patient care  
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**Title:**

**Varying uses of the ABCD2 scoring system in primary and secondary care: a qualitative study**

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49 DE, SC, NM, SM and JM developed the original idea and protocol. DE, SC, NM and SV  
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Participants gave informed consent for transcripts to be used in research provided that quotes are anonymised and information used in reports could not lead to identification.

**ABSTRACT**

**Objectives:** To explore the usage of the ABCD2 risk stratification score by general practitioners and hospital staff during the referral of patients with suspected transient ischaemic attack (TIA) or minor stroke.

**Design:** Qualitative study using semi-structured interviews.

**Setting:** Nine general practices and two hospital sites in England (Birmingham and Cambridge).

**Participants:** Nine general practitioners, nine hospital staff (two consultants, four nurses, two ultrasonographers and one administrator).

**Results:** In both sites, clinicians used a referral proforma based around the ABCD2 scoring system for a range of purposes including self-education, to assist emphasising urgency to the patient, as a referral pathway facilitator and as a diagnostic tool. Negative views of its role included potential medico-legal threat, that it was a barrier to appropriate care, and led to mis-diagnosis. Despite having differing uses by different clinicians, the ABCD2 proforma was the central means of inter-professional communication in TIA referrals across both sites.

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9 **Conclusions:** Understanding how prediction rules are used in practice is key to  
10 determining their impact on processes of care and clinical outcomes. In practice, GPs and  
11 their colleagues use the ABCD2 score in subtly different ways and it functions as a  
12 “boundary object” by both accommodating these multiple purposes, yet still successfully  
13 aiding communication between them.  
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## Introduction

The ABCD2 score is a clinical prediction rule developed in 2007 to predict the risk of recurrent stroke soon after transient ischaemic attack (TIA) [Johnston et al 2007; Giles et al 2010]. The score has rapidly become an integral part of the referral process for TIA internationally [NICE 2008; RCP 2010; Easton et al 2009; National Stroke Foundation 2008; Stroke Foundation of New Zealand 2008] and often forms part of a “proforma” – a form which integrates standardised protocols and frequently clinical prediction rules – for referrals to secondary care. Such proformas are increasingly common for primary to secondary care communication: in April 2011 Addenbrookes Hospital in Cambridge, UK, requested the use of a proforma for 48 conditions ranging from early inflammatory arthritis to suspected renal colic.

Despite the increasing use of proformas, there is only limited research into their use or impact [Akbari et al 2008]. For example, the ABCD2 score was derived and validated in secondary care as a prognostic score, yet the UK’s National Institute for Health and Clinical Excellence [NICE 2008] recommends its use in all referrals of suspected TIA by General Practitioners (GPs) and accident and emergency (A&E) departments despite evidence of substantial disagreement between specialist and generalist scores [Kinsella et al 2011 and Wong et al 2012]. We studied the ABCD2 score’s use across different parts of the health service in order to analyse how the score and its associated proforma are used in everyday clinical practice.

### Box 1: Description of the ABCD2 clinical prediction rule for stroke risk after TIA

Age $\geq$ 60	1 point
Blood Pressure $\geq$ 140/90 mmHg at acute evaluation	1 point
Clinical features	1 point for speech disturbance without weakness; 2 points for unilateral weakness
Duration	1 point for 10-59 minutes, 2 points for $\geq$ 60 minutes
Diabetes	1 point
Patients scoring 4 or more points are deemed high risk. [NICE 2008]	

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Our theoretical background comes from an area of social science research that looks at the increasing role of forms and other systems of standardisation in medical practice. Although protocols are frequently criticised because they constrain and dictate practice, rendering individual decision-making redundant, Timmermans and Berg [1997] argue that this criticism is misplaced. Rather, an inherent aspect of any useful protocol is that it can accommodate local deviation. Individuals invariably ‘tinker’ with them, whilst ensuring they are not undermined, such that they are workable for each specific circumstance. As a result, a protocol often becomes what has been termed a ‘boundary object’ [Leigh Star 2010]. This term refers to any item or procedure that is sufficiently standardised to ensure a common meaning or action is established across different specialist fields, yet also is sufficiently flexible to allow for adaptation to make it useful and meaningful in local contexts. As a result, though there may well be significant differences between various locations or areas of expertise, boundary objects serve to provide common ground, and are thus a way of establishing overall coherence and integration.

## Methods

### Participants and procedures

This study was a prelude to a randomised controlled trial of a novel method for stroke prevention in primary care. Participants were recruited from two locations (Cambridgeshire/Addenbrookes hospital and West Midlands/Queen Elizabeth hospital) to permit exploration of variation between sites. The TIA clinics in both areas had independently created proformas which they requested be completed for all referrals, in which the ABCD2 score was central.

Eligible GPs had to be within the catchment area of Addenbrooke’s or Queen Elizabeth hospital TIA clinic while staff members included any within these hospitals who regularly encountered patients with suspected TIA. GPs were approached by e-mail using the mailing lists of local research networks with one sampling criteria, that there should be a mix of GPs from Birmingham and Cambridgeshire (these GPs had an obligation and/or interest in participating in

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research generally, and so this convenience sampling method greatly increased our response rate and reduced the chance of exclusively recruiting stroke enthusiasts), and nine of ten volunteer GPs contacted were interviewed: in total we interviewed six Cambridgeshire GPs and three Birmingham GPs. We identified our sample of secondary care informants by adopting a “snowball method”, starting with a consultant interview at each site and then progressively identifying key players in the TIA referral process: as a result we identified a cross section of staff involved in many potential TIA management pathways. Interviewees were approached by e-mail, telephone or in person, often with the assistance of the previous interviewee; all approached interviewees consented to interview: in total we interviewed two stroke consultants; three stroke nurses; two ultrasonographers involved in assessing TIA patients; one stroke team administrator (who liaised with patients, GPs and ensured ABCD2 score proformas were actioned) and one A&E triaging nurse. Five of the hospital staff came from Queen Elizabeth Hospital and four from Addenbrookes, with an equal number of doctors (one) and nurses (two) from each site.

### Interviews

Face-to-face interviews followed a topic guide generated by the research team that was initially piloted. The focus was not specifically on the ABCD2 form, but rather to establish a qualitative understanding of experiences along the pathway from GP consultation to TIA clinic referral, inviting professionals to draw on past cases they had referred or been referred. Written consent was confirmed prior to interview, and interviews lasted on average one hour. They were audio-recorded and then transcribed verbatim by a professional transcription service. DE, NM (both GPs), SC (medical anthropologist), and SV (qualitative researcher) conducted the interviews at the hospital site (hospital staff members) or at the GP’s practice (GPs).. The interviewer checked the full transcription against the audio-recording for accuracy. Question prompts are provided as an appendix.

### Analysis

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8 DE, SC and NM read through the transcripts and established central themes that were  
9 raised. An initial sample of transcripts was coded independently by DE and SC (using  
10 NVivo) to ensure reliability and to revise codes where necessary. Subsequent themes that  
11 emerged as these were applied to the remaining transcripts were always discussed within  
12 the team, and if adopted, coded across the entire dataset.  
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17 It was clear that much discussion regarding suspected TIAs - when it was appropriate to  
18 refer, whether they should be considered urgent cases, and possible patient pathways that  
19 could be followed - centred on the current use of the ABCD2 proforma. This was  
20 therefore identified as a pivotal issue that would serve to capture many of the more  
21 general comments made, and provide a specific focus to explore how a suspected TIA is  
22 negotiated in referral pathways. As a result, DE and SC undertook further analysis of the  
23 transcripts; any direct or indirect mention of the ABCD2 scoring system, or practical use  
24 of a proforma in the referral pathway, was consequently noted in every transcript in a  
25 thematic analysis. Further coding allowed a detailed typology of varying roles associated  
26 with the ABCD2 score and the proforma itself (if used); this included both positive and  
27 negative features of its use.  
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### 34 **Results**

35 Nine GPs and nine hospital staff took part in the study (see Table 1 for interviewee  
36 characteristics).  
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40 **Table 1: Interviewee characteristics**

41 <b>Role</b>	42 <b>Use the ABCD2 43 score?</b>
44 <b>GP, Cambridgeshire</b>	<b>yes</b>
45 <b>GP, Cambridgeshire</b>	<b>no</b>
46 <b>GP, West Midlands</b>	<b>yes</b>
47 <b>Consultant</b>	<b>yes</b>
48 <b>Stroke specialist nurse</b>	<b>yes</b>
49 <b>Stroke staff nurse</b>	<b>no</b>
50 <b>A&amp;E department triage nurse</b>	<b>no</b>

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Ultrasonographer	no
Clinic administrator	yes

### Use of ABCD2 amongst health professionals

Even though a relatively small sample of GPs and secondary care staff who use the score were interviewed, a surprising variety of different uses for the proforma/ABCD2 score were described (See Tables 2 and 3).

**Table 2: Roles of the ABCD2 proforma with exemplar quotes**

1.	<b>Might generate medico-legal threat</b>	“You might have to justify in the future why you haven’t followed a guideline” (901, Cambridgeshire GP)
2.	<b>Demonstrates need for urgency to patient</b>	“it sometimes provokes a little bit of alarm” (701, Cambridgeshire GP)
3.	<b>Educates the patient</b>	“when things have sometimes had the hospital stamp of approval, it’s easier to explain things, so they see a clear-cut pathway basically” (702, Cambridgeshire GP)
4.	<b>Diagnostic tool</b>	“you’ve got the tick box, it helps define what is a TIA and that score thing is very helpful” (605, Birmingham GP)
5.	<b>Prognostic tool</b>	“a lower score makes it okay to send it to the next TIA clinic and a higher score you send it urgently” (702, Cambridgeshire GP)
6.	<b>Demonstrates need for urgency to the GP</b>	“It didn’t feel right to send somebody to hospital very urgently who seems perfectly alright... Having the score there sort of gives you a bit of confidence to do just that” (703, Cambridgeshire GP)
7.	<b>Facilitates smoother patient pathway</b>	“It’s just simpler because we know what they need and it’s a way of getting it” (610, Birmingham GP)
8.	<b>Educates/reminds the GP what to do</b>	“I usually dig it out if I’m thinking to refer somebody to that clinic just to remind myself... it’s always useful to have something in front of you” (605, Birmingham GP)
9.	<b>Distils a complex history</b>	“you simply go ‘Okay, you fit a number, you need to go in, we need to refer you, there’s a degree of urgency’” (701, Cambridgeshire GP)
10.	<b>Obscures a complex history</b>	“You get an idea from the actual GP, the history and what the patient’s told you more than you can from the score really” (606,



		specialist nurse)
11.	<b>Misleading GPs about diagnosis</b>	“If you start from the right places, that this was a TIA, it’s fine, but as I say, just because you’re 80, you’ve got diabetes and hypertension, you automatically score three... so it has no diagnostic value, the ABCD2 score” (711, consultant)
12.	<b>Prevents inappropriate referrals</b>	“Some GPs lie to get them into clinic. Not so much now that we’ve changed the pro forma” (710, specialist nurse)
13.	<b>Barrier to appropriate care</b>	“Our vision... would be to have a TIA hotline... and using that system I wouldn’t bother using the ABCD2 score” (602, consultant)

**Table 3: Comparing roles of the ABCD2 score by GPs and by hospital staff**

	<b>Primary care staff (nine GPs &amp; one A&amp;E triage nurse)</b>	<b>Specialist doctors, nurses &amp; administrator</b>	<b>Hospital support staff (technicians &amp; staff nurse)</b>
Never use the score	40% (n=4)		100% (n=3)
Do use the score	60% (n=6)	100% (n=5)	

Might generate medico-legal threat	X	
Demonstrates need for urgency to patient	X	
Educates the patient	X	
Diagnostic tool	X	
Prognostic tool	X	X
Demonstrates need for urgency to the GP	X	X
Facilitates smoother patient pathway	X	X
Educates/reminds the GP what to do	X	X
Distils a complex history	X	X
Obscures a complex history		X
Misleading GPs about diagnosis		X

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Prevents inappropriate referrals		X
Barrier to appropriate care		X
Note: X indicates this theme was raised by at least one of the participants of the sub-group		

### Use of the ABCD2 in general practice

For those GPs who use the scoring system, it was clear that they both liked and complied with its use as it offers a tangible means to navigate the referral system. Most did not ever consider their scoring as inaccurate. However, they primarily regard it as the key mechanism to access services on behalf of a patient, at which point a more definitive diagnosis be made based on specialist expertise and technological procedures:

*It was just a case of looking, getting the score and then speaking to the medical liaison sister.... I think it's quite useful, I really quite like that scoring system because it does give you a bit of confidence about what to do, because otherwise it can be a bit nebulous.*

Cambridgeshire GP, 703

GPs described how they didn't feel the need to make a definitive diagnosis, but rather used the form to defer this to the hospital. Thus, the scoring system serves as a tool to systematise their evaluation of a patient within their consultation, yet also ensures a referral to secondary care happens swiftly.

When completing the form, GPs consider potentially relevant patient history to be a broad category. Beyond the specific clinical focus that might relate to a suspected TIA, many express how they cannot simply ignore a wide range of other factors that might possibly be central to the patients' current health status. These aspects, which are not part of the scoring system, can consequently influence how scores are eventually arrived at as GPs try to assess what the consequence of an overall score is likely to be:

*Obviously each patient's not the same, so sometimes you do need a little bit of adaption.*

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9 Birmingham GP, 608

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11 GPs also adapted their own management in response to the form, for example using it to  
12 remind them about TIAs, to educate the patient, or to persuade patients that the problem  
13 was urgent and that referral needed to be carried out urgently.  
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17 **The ABCD2 use by hospital staff**

18 Hospital staff viewed the score more restrictively as a reliable record of the clinical event  
19 itself. As a result, they sometimes view the GPs approach as problematic or even  
20 careless, since it leads to what they view as inaccuracies and inappropriate referrals:  
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24 *If we all did what we're meant to, it would be great*

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26 Stroke consultant, 711

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28 Unlike the GPs, who view the score within their own consultations as a checklist to  
29 ensure sufficient scope of questioning and externally as a mechanism to justify referral,  
30 staff in the hospital see the score as ideally an objective evaluation of severity of  
31 prognosis.  
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36 *Our protocol I think it is quite clear... it's about a three or four page*  
37 *document, it gives them [GPs] advice on which medications to start, how*  
38 *to administer the ABCD2 score, and then lots of ways for different people.*

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40 Stroke consultant 711

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43 As a natural consequence of this perspective, patients who, it turns out, have not had  
44 TIAs but satisfied the scoring to some degree are said to “mimic” genuine TIA patients  
45 according to the criteria set out in the ABCD2 form:  
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49 *We get so many mimics referred to the clinic, making sure you're dealing with the*  
50 *right diagnosis is probably the first issue.*

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52 Specialist nurse, 602

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10 Various negative terms including “uneducated”, “inappropriate”, “challenging” and  
11 “dubious” are also used to describe referrals or patients in similar circumstances.  
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14 Many of the interviews with hospital staff acknowledged that a GP or emergency doctor  
15 may “misbehave” or “use [the TIA clinic] as a place to send patients they don’t know  
16 what to do with” and refer patients that they know cannot be a “genuine” TIA. The  
17 ABCD2 score is also seen as potentially misleading when used inappropriately.  
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21 *I think we would say if you start from the right place, the ABCD2 scores would*  
22 *discriminate between the high risk and the low risk and people who need urgent*  
23 *and maybe less urgent investigations, but... a lot of people that we see in the*  
24 *clinic I'd imagine their age is probably somewhere in their 80s, then they*  
25 *inappropriately score high than other conditions. So it had no diagnostic value,*  
26 *the ABCD2 score, but it's got some prognostic value in relation to high risk, low*  
27 *risk stuff. So I think people are using it as a sort of diagnostic tool for TIA, that's*  
28 *how it's used inappropriately.*  
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33 Stroke consultant, 711  
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36 This concern about reliability, however, is most relevant if the ABCD2 proforma system  
37 is meant to serve exactly the same single purpose within both primary and secondary  
38 care. Secondary care users of the ABCD2 score emphasised the original intended use of  
39 the ABCD2 score (prognostication) more and discussed a greater number of negative  
40 alternate roles of the ABCD2 score (diagnostically confusing, obscuring the history, a  
41 barrier to appropriate care) versus primary care users of the ABCD2 score.  
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#### 45 **ABCD2 non-users**

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47 Our interviews revealed that hospital staff not involved in triaging referrals - two  
48 radiographers and a nurse involved in scanning and caring for patients with TIA on a  
49 weekly basis - were unaware of the ABCD2 score. Similarly, a proportion of primary  
50 care staff interviewed also do not currently use the ABCD2 proforma (40%, n=4, three  
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8 GPs and one A&E triage nurse). All cited lack of knowledge, but gave differing  
9 interpretations as to why this is so. One GP was “ashamed” but three interviewees felt  
10 they didn’t use the score or proforma with good reason:  
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13 *I’m not familiar I have to say, but I think it would be mostly in my history*  
14 *already.*

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17 Cambridge GP, 801

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19 *I don’t think I was aware of it really, I imagine this is some sort of guideline*  
20 *system is it? ... you wouldn’t believe how many guidelines there are.*

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23 Cambridge GP, 901

24  
25 *If you’re going to use a scoring system it needs to be universal... everybody needs*  
26 *to be aware of it for it to be an effective tool.*

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30 A&E triage nurse, 714

31 Overall our findings describe both the varied use of the form, and also the way it  
32 functions to provide a simple linkage between primary and secondary care. When the  
33 ABCD2 proforma is not adopted, GPs rely on methods such as referral letters and  
34 sending patients directly to A&E, communication and contact is largely one way and is  
35 not shaped by the expectations of secondary care.  
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### 38 39 **Discussion**

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41 Whilst it might be argued that this study is limited by the number of interviews  
42 conducted, it nevertheless is based on a commitment to capture as broad a set of views  
43 from relevant actors as possible. The choice to focus on just two centres of practice  
44 (Birmingham and Cambridge), brings the advantage of being able to elicit some specific  
45 and subtle descriptions but inevitably limits the generalisation of findings. Nevertheless,  
46 the overall argument concerning the multiple function of the ABCD2 score, and the  
47 adoption of protocols more generally, is robust given the general consistency of the data  
48 collected.  
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Our interviews with a range of health professionals clearly show that the apparently simple ABCD2 scoring system adopted within GP referral proformas serves a variety of different roles. We identified 13 functions, both positive and negative; of these, five were shared, four were specific to GPs, and four were specific to hospital staff. Whilst we are not claiming that the classification is definitive or exactly defined, this variety suggests that the proforma does not only standardise but can also sustain sufficient flexibility to serve a range of local purposes. This suggests that efforts to improve prognostic accuracy of clinical prediction rules ([including current controversies over the prognostic accuracy of the ABCD2 score and proposed alternatives](#)) [Calvet et al 2009; Asimos et al 2009; Ay et al 2009; Giles et al 2010; [Johnston 2010; Tsivgoulis and Heliopoulos 2010; Perry et al 2011; Raser et al 2011; Amarenco et al 2012; Sanders et al 2012](#)] should be accompanied by research and development of the other aspects of their usefulness.

Complex scientific fields such as medicine inevitably involve multiple domains of expertise, each of which has its own perspective and priorities that shapes the way things being studied are conceived and dealt with [Mol, 2002]. In order for pluralism across different subfields not to lead to fragmentation, there has to be what contemporary philosopher Hacking [1996] calls conceptual “unifiers” that span and integrate any discontinuities. In this vein, the notion of a “boundary object” describes those things, whether material or theoretical, that are both sufficiently stable to be treated as the same thing by different groups of scientists, and yet also flexible enough for them to operate and make sense with each of the different subfields [Leigh Star 2010].

In our study of the referral of suspected TIA patients from GP practices to the TIA clinic, one might have initially assumed that the “boundary object” is the patient, since she obviously moves from one site to another and apparently aligns primary and secondary services. However, our interviews reveal that the patient is not considered the chief means by which the two sites connect and establish a common point of reference, rather, it is the completed ABCD2 form.

Clinical prediction research needs to have a post-implementation phase in order to understand how the original research is used in practice, since this will determine its

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ultimate effect on processes of care and clinical outcomes. In current clinical practice, GPs could utilise a greater awareness of how clinical prediction rules practically function to improve referrals and referral pathways, and should consider communicating their significance to patients.

For peer review only

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**Title:**

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52 **Contributors and guarantor:**

53 DE, SC, NM, SM and JM developed the original idea and protocol. DE, SC, NM and SV  
54 conducted the interviews. DE and SC led the qualitative analysis and drafted the paper.  
55 DE, SC, NM, SV, DL, SM, MG, RM and JM contributed to the writing of the final  
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Participants gave informed consent for transcripts to be used in research provided that quotes are anonymised and information used in reports could not lead to identification.

**ABSTRACT**

**Objectives:** To explore the usage of the ABCD2 risk stratification score by general practitioners and hospital staff during the referral of patients with suspected transient ischaemic attack (TIA) or minor stroke.

**Design:** Qualitative study using semi-structured interviews.

**Setting:** Nine general practices and two hospital sites in England (Birmingham and Cambridge).

**Participants:** Nine general practitioners, nine hospital staff (two consultants, four nurses, two ultrasonographers and one administrator).

**Results:** In both sites, clinicians used a referral proforma based around the ABCD2 scoring system for a range of purposes including self-education, to assist emphasising urgency to the patient, as a referral pathway facilitator and as a diagnostic tool. Negative views of its role included potential medico-legal threat, that it was a barrier to appropriate care, and led to mis-diagnosis. Despite having differing uses by different clinicians, the ABCD2 proforma was the central means of inter-professional communication in TIA referrals across both sites.

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3 **Conclusions:** Understanding how prediction rules are used in practice is key to  
4 determining their impact on processes of care and clinical outcomes. In practice, GPs and  
5 their colleagues use the ABCD2 score in subtly different ways and it functions as a  
6 “boundary object” by both accommodating these multiple purposes, yet still successfully  
7 aiding communication between them.  
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## Introduction

The ABCD2 score is a clinical prediction rule developed in 2007 to predict the risk of recurrent stroke soon after transient ischaemic attack (TIA) [Johnston et al 2007; Giles et al 2010]. The score has rapidly become an integral part of the referral process for TIA internationally [NICE 2008; RCP 2010; Easton et al 2009; National Stroke Foundation 2008; Stroke Foundation of New Zealand 2008] and often forms part of a “proforma” – a form which integrates standardised protocols and frequently clinical prediction rules – for referrals to secondary care. Such proformas are increasingly common for primary to secondary care communication: in April 2011 Addenbrookes Hospital in Cambridge, UK, requested the use of a proforma for 48 conditions ranging from early inflammatory arthritis to suspected renal colic.

Despite the increasing use of proformas, there is only limited research into their use or impact [Akbari et al 2008]. For example, the ABCD2 score was derived and validated in secondary care as a prognostic score, yet the UK’s National Institute for Health and Clinical Excellence [NICE 2008] recommends its use in all referrals of suspected TIA by General Practitioners (GPs) and accident and emergency (A&E) departments despite evidence of substantial disagreement between specialist and generalist scores [Kinsella et al 2011 and Wong et al 2012]. We studied the ABCD2 score’s use across different parts of the health service in order to analyse how the score and its associated proforma are used in everyday clinical practice.

### Box 1: Description of the ABCD2 clinical prediction rule for stroke risk after TIA

Age $\geq$ 60	1 point
Blood Pressure $\geq$ 140/90 mmHg at acute evaluation	1 point
Clinical features	1 point for speech disturbance without weakness; 2 points for unilateral weakness
Duration	1 point for 10-59 minutes, 2 points for $\geq$ 60 minutes
Diabetes	1 point
Patients scoring 4 or more points are deemed high risk. [NICE 2008]	

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3 Our theoretical background comes from an area of social science research that looks at  
4 the increasing role of forms and other systems of standardisation in medical practice.  
5 Although protocols are frequently criticised because they constrain and dictate practice,  
6 rendering individual decision-making redundant, Timmermans and Berg [1997] argue  
7 that this criticism is misplaced. Rather, an inherent aspect of any useful protocol is that it  
8 can accommodate local deviation. Individuals invariably ‘tinker’ with them, whilst  
9 ensuring they are not undermined, such that they are workable for each specific  
10 circumstance. As a result, a protocol often becomes what has been termed a ‘boundary  
11 object’ [Leigh Star 2010]. This term refers to any item or procedure that is sufficiently  
12 standardised to ensure a common meaning or action is established across different  
13 specialist fields, yet also is sufficiently flexible to allow for adaptation to make it useful  
14 and meaningful in local contexts. As a result, though there may well be significant  
15 differences between various locations or areas of expertise, boundary objects serve to  
16 provide common ground, and are thus a way of establishing overall coherence and  
17 integration.  
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## 32 **Methods**

### 33 **Participants and procedures**

34 This study was a prelude to a randomised controlled trial of a novel method for stroke  
35 prevention in primary care. Participants were recruited from two locations  
36 (Cambridgeshire/Addenbrookes hospital and West Midlands/Queen Elizabeth hospital) to  
37 permit exploration of variation between sites. The TIA clinics in both areas had  
38 independently created proformas which they requested be completed for all referrals, in  
39 which the ABCD2 score was central.  
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48 Eligible GPs had to be within the catchment area of Addenbrooke’s or Queen  
49 Elizabeth hospital TIA clinic while staff members included any within these  
50 hospitals who regularly encountered patients with suspected TIA. GPs were  
51 approached by e-mail using the mailing lists of local research networks with one  
52 sampling criteria, that there should be a mix of GPs from Birmingham and  
53 Cambridgeshire (these GPs had an obligation and/or interest in participating in  
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research generally, and so this convenience sampling method greatly increased our response rate and reduced the chance of exclusively recruiting stroke enthusiasts), and nine of ten volunteer GPs contacted were interviewed: in total we interviewed six Cambridgeshire GPs and three Birmingham GPs. We identified our sample of secondary care informants by adopting a “snowball method”, starting with a consultant interview at each site and then progressively identifying key players in the TIA referral process: as a result we identified a cross section of staff involved in many potential TIA management pathways. Interviewees were approached by e-mail, telephone or in person, often with the assistance of the previous interviewee; all approached interviewees consented to interview: in total we interviewed two stroke consultants; three stroke nurses; two ultrasonographers involved in assessing TIA patients; one stroke team administrator (who liaised with patients, GPs and ensured ABCD2 score proformas were actioned) and one A&E triaging nurse. Five of the hospital staff came from Queen Elizabeth Hospital and four from Addenbrookes, with an equal number of doctors (one) and nurses (two) from each site.

### Interviews

Face-to-face interviews followed a topic guide generated by the research team that was initially piloted. The focus was not specifically on the ABCD2 form, but rather to establish a qualitative understanding of experiences along the pathway from GP consultation to TIA clinic referral, inviting professionals to draw on past cases they had referred or been referred. Written consent was confirmed prior to interview, and interviews lasted on average one hour. They were audio-recorded and then transcribed verbatim by a professional transcription service. DE, NM (both GPs), SC (medical anthropologist), and SV (qualitative researcher) conducted the interviews at the hospital site (hospital staff members) or at the GP’s practice (GPs).. The interviewer checked the full transcription against the audio-recording for accuracy. Question prompts are provided as an appendix.

### Analysis

DE, SC and NM read through the transcripts and established central themes that were raised. An initial sample of transcripts was coded independently by DE and SC (using NVivo) to ensure reliability and to revise codes where necessary. Subsequent themes that emerged as these were applied to the remaining transcripts were always discussed within the team, and if adopted, coded across the entire dataset.

It was clear that much discussion regarding suspected TIAs - when it was appropriate to refer, whether they should be considered urgent cases, and possible patient pathways that could be followed - centred on the current use of the ABCD2 proforma. This was therefore identified as a pivotal issue that would serve to capture many of the more general comments made, and provide a specific focus to explore how a suspected TIA is negotiated in referral pathways. As a result, DE and SC undertook further analysis of the transcripts; any direct or indirect mention of the ABCD2 scoring system, or practical use of a proforma in the referral pathway, was consequently noted in every transcript in a thematic analysis. Further coding allowed a detailed typology of varying roles associated with the ABCD2 score and the proforma itself (if used); this included both positive and negative features of its use.

## Results

Nine GPs and nine hospital staff took part in the study (see Table 1 for interviewee characteristics).

**Table 1: Interviewee characteristics**

Role	Use the ABCD2 score?
GP, Cambridgeshire	yes
GP, Cambridgeshire	no
GP, West Midlands	yes
Consultant	yes
Stroke specialist nurse	yes
Stroke staff nurse	no
A&E department triage nurse	no

Ultrasonographer	no
Clinic administrator	yes

### Use of ABCD2 amongst health professionals

Even though a relatively small sample of GPs and secondary care staff who use the score were interviewed, a surprising variety of different uses for the proforma/ABCD2 score were described (See Tables 2 and 3).

**Table 2: Roles of the ABCD2 proforma with exemplar quotes**

1.	<b>Might generate medico-legal threat</b>	“You might have to justify in the future why you haven’t followed a guideline” (901, Cambridgeshire GP)
2.	<b>Demonstrates need for urgency to patient</b>	“it sometimes provokes a little bit of alarm” (701, Cambridgeshire GP)
3.	<b>Educates the patient</b>	“when things have sometimes had the hospital stamp of approval, it’s easier to explain things, so they see a clear-cut pathway basically” (702, Cambridgeshire GP)
4.	<b>Diagnostic tool</b>	“you’ve got the tick box, it helps define what is a TIA and that score thing is very helpful” (605, Birmingham GP)
5.	<b>Prognostic tool</b>	“a lower score makes it okay to send it to the next TIA clinic and a higher score you send it urgently” (702, Cambridgeshire GP)
6.	<b>Demonstrates need for urgency to the GP</b>	“It didn’t feel right to send somebody to hospital very urgently who seems perfectly alright... Having the score there sort of gives you a bit of confidence to do just that” (703, Cambridgeshire GP)
7.	<b>Facilitates smoother patient pathway</b>	“It’s just simpler because we know what they need and it’s a way of getting it” (610, Birmingham GP)
8.	<b>Educates/reminds the GP what to do</b>	“I usually dig it out if I’m thinking to refer somebody to that clinic just to remind myself... it’s always useful to have something in front of you” (605, Birmingham GP)
9.	<b>Distils a complex history</b>	“you simply go ‘Okay, you fit a number, you need to go in, we need to refer you, there’s a degree of urgency’” (701, Cambridgeshire GP)
10.	<b>Obscures a complex history</b>	“You get an idea from the actual GP, the history and what the patient’s told you more than you can from the score really” (606,

		specialist nurse)
11.	<b>Misleading GPs about diagnosis</b>	“If you start from the right places, that this was a TIA, it’s fine, but as I say, just because you’re 80, you’ve got diabetes and hypertension, you automatically score three... so it has no diagnostic value, the ABCD2 score” (711, consultant)
12.	<b>Prevents inappropriate referrals</b>	“Some GPs lie to get them into clinic. Not so much now that we’ve changed the pro forma” (710, specialist nurse)
13.	<b>Barrier to appropriate care</b>	“Our vision... would be to have a TIA hotline... and using that system I wouldn’t bother using the ABCD2 score” (602, consultant)

**Table 3: Comparing roles of the ABCD2 score by GPs and by hospital staff**

	<b>Primary care staff (nine GPs &amp; one A&amp;E triage nurse)</b>	<b>Specialist doctors, nurses &amp; administrator</b>	<b>Hospital support staff (technicians &amp; staff nurse)</b>
<b>Never use the score</b>	<b>40% (n=4)</b>		<b>100% (n=3)</b>
<b>Do use the score</b>	<b>60% (n=6)</b>	<b>100% (n=5)</b>	

<b>Might generate medico-legal threat</b>	<b>X</b>	
<b>Demonstrates need for urgency to patient</b>	<b>X</b>	
<b>Educates the patient</b>	<b>X</b>	
<b>Diagnostic tool</b>	<b>X</b>	
<b>Prognostic tool</b>	<b>X</b>	<b>X</b>
<b>Demonstrates need for urgency to the GP</b>	<b>X</b>	<b>X</b>
<b>Facilitates smoother patient pathway</b>	<b>X</b>	<b>X</b>
<b>Educates/reminds the GP what to do</b>	<b>X</b>	<b>X</b>
<b>Distils a complex history</b>	<b>X</b>	<b>X</b>
<b>Obscures a complex history</b>		<b>X</b>
<b>Misleading GPs about diagnosis</b>		<b>X</b>

<b>Prevents inappropriate referrals</b>		<b>X</b>
<b>Barrier to appropriate care</b>		<b>X</b>
<b>Note: X indicates this theme was raised by at least one of the participants of the sub-group</b>		

### **Use of the ABCD2 in general practice**

For those GPs who use the scoring system, it was clear that they both liked and complied with its use as it offers a tangible means to navigate the referral system. Most did not ever consider their scoring as inaccurate. However, they primarily regard it as the key mechanism to access services on behalf of a patient, at which point a more definitive diagnosis be made based on specialist expertise and technological procedures:

*It was just a case of looking, getting the score and then speaking to the medical liaison sister.... I think it's quite useful, I really quite like that scoring system because it does give you a bit of confidence about what to do, because otherwise it can be a bit nebulous.*

Cambridgeshire GP, 703

GPs described how they didn't feel the need to make a definitive diagnosis, but rather used the form to defer this to the hospital. Thus, the scoring system serves as a tool to systematise their evaluation of a patient within their consultation, yet also ensures a referral to secondary care happens swiftly.

When completing the form, GPs consider potentially relevant patient history to be a broad category. Beyond the specific clinical focus that might relate to a suspected TIA, many express how they cannot simply ignore a wide range of other factors that might possibly be central to the patients' current health status. These aspects, which are not part of the scoring system, can consequently influence how scores are eventually arrived at as GPs try to assess what the consequence of an overall score is likely to be:

*Obviously each patient's not the same, so sometimes you do need a little bit of adaption.*

Birmingham GP, 608

GPs also adapted their own management in response to the form, for example using it to remind them about TIAs, to educate the patient, or to persuade patients that the problem was urgent and that referral needed to be carried out urgently.

### **The ABCD2 use by hospital staff**

Hospital staff viewed the score more restrictively as a reliable record of the clinical event itself. As a result, they sometimes view the GPs approach as problematic or even careless, since it leads to what they view as inaccuracies and inappropriate referrals:

*If we all did what we're meant to, it would be great*

Stroke consultant, 711

Unlike the GPs, who view the score within their own consultations as a checklist to ensure sufficient scope of questioning and externally as a mechanism to justify referral, staff in the hospital see the score as ideally an objective evaluation of severity of prognosis.

*Our protocol I think it is quite clear... it's about a three or four page document, it gives them [GPs] advice on which medications to start, how to administer the ABCD2 score, and then lots of ways for different people.*

Stroke consultant 711

As a natural consequence of this perspective, patients who, it turns out, have not had TIAs but satisfied the scoring to some degree are said to “mimic” genuine TIA patients according to the criteria set out in the ABCD2 form:

*We get so many mimics referred to the clinic, making sure you're dealing with the right diagnosis is probably the first issue.*

Specialist nurse, 602

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5 Various negative terms including “uneducated”, “inappropriate”, “challenging” and  
6 “dubious” are also used to describe referrals or patients in similar circumstances.  
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10 Many of the interviews with hospital staff acknowledged that a GP or emergency doctor  
11 may “misbehave” or “use [the TIA clinic] as a place to send patients they don’t know  
12 what to do with” and refer patients that they know cannot be a “genuine” TIA. The  
13 ABCD2 score is also seen as potentially misleading when used inappropriately:  
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19 *I think we would say if you start from the right place, the ABCD2 scores would*  
20 *discriminate between the high risk and the low risk and people who need urgent*  
21 *and maybe less urgent investigations, but... a lot of people that we see in the*  
22 *clinic I'd imagine their age is probably somewhere in their 80s, then they*  
23 *inappropriately score high than other conditions. So it had no diagnostic value,*  
24 *the ABCD2 score, but it's got some prognostic value in relation to high risk, low*  
25 *risk stuff. So I think people are using it as a sort of diagnostic tool for TIA, that's*  
26 *how it's used inappropriately.*  
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33 Stroke consultant, 711  
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37 This concern about reliability, however, is most relevant if the ABCD2 proforma system  
38 is meant to serve exactly the same single purpose within both primary and secondary  
39 care. Secondary care users of the ABCD2 score emphasised the original intended use of  
40 the ABCD2 score (prognostication) more and discussed a greater number of negative  
41 alternate roles of the ABCD2 score (diagnostically confusing, obscuring the history, a  
42 barrier to appropriate care) versus primary care users of the ABCD2 score.  
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#### 49 **ABCD2 non-users**

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51 Our interviews revealed that hospital staff not involved in triaging referrals - two  
52 radiographers and a nurse involved in scanning and caring for patients with TIA on a  
53 weekly basis - were unaware of the ABCD2 score. Similarly, a proportion of primary  
54 care staff interviewed also do not currently use the ABCD2 proforma (40%, n=4, three  
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3 GPs and one A&E triage nurse). All cited lack of knowledge, but gave differing  
4 interpretations as to why this is so. One GP was “ashamed” but three interviewees felt  
5 they didn’t use the score or proforma with good reason:  
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10 *I’m not familiar I have to say, but I think it would be mostly in my history*  
11 *already.*  
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13 Cambridge GP, 801  
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17 *I don’t think I was aware of it really, I imagine this is some sort of guideline*  
18 *system is it? ... you wouldn’t believe how many guidelines there are.*  
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20 Cambridge GP, 901  
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24 *If you’re going to use a scoring system it needs to be universal... everybody needs*  
25 *to be aware of it for it to be an effective tool.*  
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27 A&E triage nurse, 714  
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31 Overall our findings describe both the varied use of the form, and also the way it  
32 functions to provide a simple linkage between primary and secondary care. When the  
33 ABCD2 proforma is not adopted, GPs rely on methods such as referral letters and  
34 sending patients directly to A&E, communication and contact is largely one way and is  
35 not shaped by the expectations of secondary care.  
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## 39 40 41 **Discussion**

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43 Whilst it might be argued that this study is limited by the number of interviews  
44 conducted, it nevertheless is based on a commitment to capture as broad a set of views  
45 from relevant actors as possible. The choice to focus on just two centres of practice  
46 (Birmingham and Cambridge), brings the advantage of being able to elicit some specific  
47 and subtle descriptions but inevitably limits the generalisation of findings. Nevertheless,  
48 the overall argument concerning the multiple function of the ABCD2 score, and the  
49 adoption of protocols more generally, is robust given the general consistency of the data  
50 collected.  
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3 Our interviews with a range of health professionals clearly show that the apparently  
4 simple ABCD2 scoring system adopted within GP referral proformas serves a variety of  
5 different roles. We identified 13 functions, both positive and negative; of these, five were  
6 shared, four were specific to GPs, and four were specific to hospital staff. Whilst we are  
7 not claiming that the classification is definitive or exactly defined, this variety suggests  
8 that the proforma does not only standardise but can also sustain sufficient flexibility to  
9 serve a range of local purposes. This suggests that efforts to improve prognostic accuracy  
10 of clinical prediction rules (including current controversies over the prognostic accuracy  
11 of the ABCD2 score and proposed alternatives) [Calvet et al 2009; Asimos et al 2009; Ay  
12 et al 2009; Giles et al 2010; Johnston 2010; Tsivgoulis and Heliopoulos 2010; Perry et al  
13 2011; Raser et al 2011; Amarenco et al 2012; Sanders et al 2012] should be accompanied  
14 by research and development of the other aspects of their usefulness.  
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26 Complex scientific fields such as medicine inevitably involve multiple domains of  
27 expertise, each of which has its own perspective and priorities that shapes the way things  
28 being studied are conceived and dealt with [Mol, 2002]. In order for pluralism across  
29 different subfields not to lead to fragmentation, there has to be what contemporary  
30 philosopher Hacking [1996] calls conceptual “unifiers” that span and integrate any  
31 discontinuities. In this vein, the notion of a “boundary object” describes those things,  
32 whether material or theoretical, that are both sufficiently stable to be treated as the same  
33 thing by different groups of scientists, and yet also flexible enough for them to operate  
34 and make sense with each of the different subfields [Leigh Star 2010].  
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43 In our study of the referral of suspected TIA patients from GP practices to the TIA clinic,  
44 one might have initially assumed that the “boundary object” is the patient, since she  
45 obviously moves from one site to another and apparently aligns primary and secondary  
46 services. However, our interviews reveal that the patient is not considered the chief  
47 means by which the two sites connect and establish a common point of reference, rather,  
48 it is the completed ABCD2 form.  
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55 Clinical prediction research needs to have a post-implementation phase in order to  
56 understand how the original research is used in practice, since this will determine its  
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3 ultimate effect on processes of care and clinical outcomes. In current clinical practice,  
4 GPs could utilise a greater awareness of how clinical prediction rules practically function  
5 to improve referrals and referral pathways, and should consider communicating their  
6 significance to patients.  
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