



Clinical decision making in a high risk primary care environment: a qualitative study in the UK

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COREQ guidelines table

Domain 1: Research team and reflexivity			Comment
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview?	JB and MB
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i>	FRCPE, MA
3.	Occupation	What was their occupation at the time of the study?	Research Fellows
4.	Gender	Was the researcher male or female?	1 male/1 female
5.	Experience and training	What experience or training did the researcher have?	>30 years qualitative research
Relationship with participants			Nil
6.	Relationship established	Was a relationship established prior to study commencement?	With some of them
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i>	Broad outlines given .
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i>	Reasons for research and interest in training
Domain 2: study design			
Theoretical framework			

COREQ guidelines table

9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>	Content analysis
Participant selection			
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i>	Convenience
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i>	Email and face-to-face
12.	Sample size	How many participants were in the study?	21
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	66% of those approached not interviewed for lack of time or interest
Setting			
14.	Setting of data collection	Where was the data collected? <i>e.g. home, clinic, workplace</i>	Clinic for most, 3 at home
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	No
16.	Description of sample	What are the important characteristics of the sample? <i>e.g. demographic data, date</i>	All experienced GPs in active clinical practice
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Pilot tested. Semi-structured interview
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No

COREQ guidelines table

19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Audiotaped
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Yes
21.	Duration	What was the duration of the interviews or focus group?	30 minutes
22.	Data saturation	Was data saturation discussed?	Yes and reached about half way
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	2
25.	Description of the coding tree	Did authors provide a description of the coding tree?	yes
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Both, as we responded to the data
27.	Software	What software, if applicable, was used to manage the data?	Yes
28.	Participant checking	Did participants provide feedback on the findings?	yes
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i>	yes

COREQ guidelines table

30.	Data and findings consistent	Was there consistency between the data presented and the findings?	yes
31.	Clarity of major themes	Were major themes clearly presented in the findings?	yes
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	yes

Summary

Article focus

- Clinical reasoning and decision making in an out of hours primary care setting.
- The aim is to gain insights into how GPs make clinical decisions and manage risk in this environment.
- Implications for system changes and training

Key messages

- Clinical decision making in OOH is dominated by rule-out strategies for severe illness or potentially high risk diseases.
- GPs use three main criteria to determine diagnostic closure: global wellness with rule-outs, responded to patient needs, presence of a reliable safety net.
- Improvements to clinical decision making could be achieved by providing routine feedback to clinical staff working in OOH, building in systems to support reflection on clinical cases, and more tailored GP training.

Strengths and limitations of this study

- The design of the study is based on a strong theoretical framework provided by the dual theory of cognition.
- Face validity through using recently seen cases.
- Limitations relate primarily to sampling, participants consisting of self-selected individuals.

Abstract

Objective To examine clinical reasoning and decision making in an out of hours (OOH) primary care setting, with the aim of gaining insights into how general practitioners (GPs) make clinical decisions and manage risk in this environment.

Design: Semi-structured interviews using open-ended questions.

Setting A two-month qualitative interview study conducted in Oxfordshire, UK.

Participants 21 GPs working in OOH primary care.

Results The most powerful themes to emerge related to dealing with urgent potentially high risk cases, keeping patients safe and responding to their needs, whilst trying to keep patients out of hospital and the concept of 'fire fighting'. There

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3 were a number of well defined characteristics that GPs reported making
4 presentations easy or difficult to deal with. Severely ill patients were straightforward,
5 whilst the elderly, with complex multisystem diseases were often difficult. GPs
6 stopped collecting clinical information and came to clinical decisions when: high risk
7 disease and severe illness requiring hospital attention has been excluded; they had
8 responded directly to the patient's needs; and there was a reliable safety net in
9 place. Learning points that GPs identified as important for trainees in the OOH
10 setting included the importance of developing rapport in spite of time pressures;
11 learning to deal with uncertainty, and learning about common presentations with a
12 focus on critical cues to exclude severe illness.
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21 **Conclusions**

22 Immediate improvements in primary care OOH could be achieved by including
23 automated and regular timely feedback system for GPs, and individual peer and
24 expert clinician support for GPs with regular meetings to discuss recent cases. In
25 addition, trainee support and mentoring to focus on clinical skills, knowledge and risk
26 management issues specific to OOH is currently required. Investigating the stopping
27 rules used for diagnostic closure may provide new insights into the root causes of
28 clinical error in such a high risk setting.
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37 **Introduction**

38 Primary care in the UK is provided during weekends, evenings and overnight by
39 various types of out of hours (OOH) services, and it has become a core component
40 of round-the-clock primary care in many countries. Accessible and high quality OOH
41 services provide an important mechanism to reduce service pressures and
42 associated costs from inappropriate use of Emergency Department services. [1] The
43 majority of OOH care in the UK is provided by general practitioners (GPs), often in
44 conjunction with emergency medical and nursing practitioners, and organised by
45 private providers or primary care trusts. Patients typically initiate contact through a
46 telephone triage system. Those requiring face to face consultations, but not urgent
47 hospital referral, are seen by a GP at a local clinic or in the patient's home.
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58 Patients who contact OOH services are more likely to have acute problems than
59 those who are seen in daytime primary care. Therefore, GPs working in OOH are
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3 likely to meet a higher number of acutely ill patients than in their routine practice.
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5 Mostly these are 'new' patients, i.e. presenting to GPs who are unlikely to know them
6 and with little or no access to their GP or hospital records. The combination of lack of
7 continuity and high incidence of acute illness provides a potentially hazardous
8 practice environment, in which errors can occur. [2] Although the incidence of
9 significant clinical error is unknown, high profile adverse incidents have received
10 significant media attention, [3] and prompted a fundamental review of OOH service
11 provision in the UK. [4] Recommendations focussed on clinical governance, more
12 effective performance management, better team work and making patient records
13 more accessible. In addition they have highlighted staff development issues such as
14 the possible use of checklists, regular feedback, improving GP training for the
15 specific demands of OOH and individualised audits.
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26 However, the ways in which GPs make clinical decisions in OOH has received little
27 attention. Yet, how clinical decisions are made under these circumstances is
28 currently unknown, and little is known of the factors that affect safety and referral
29 patterns. We therefore examined clinical reasoning and decision making in an OOH
30 setting, with the aim of gaining insights into how GPs manage risk whilst keeping
31 patients safe in this environment and focussing on factors that may improve the
32 delivery of services.
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41 Methodology

42 We have previously published a model of clinical reasoning based on our work with
43 GPs. [5] The assumption behind the model was that understanding the reasoning
44 process was essential for fruitful reflection on clinical practice. The model highlights
45 key areas of knowledge and critical value judgments that are used in the clinical
46 encounter. We used this model, which is derived from the dual theory of cognition,
47 [6] as the framework for a qualitative study of OOH practice. [7] We are not aware of
48 other studies that have tested the applicability of similar theory-based models to real
49 life consultations, though generic theoretical models have been proposed. [8]
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58 Setting and cohort

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3 We conducted a two month study in Oxfordshire, UK where OOH care is provided by
4 a combination of different services. Most weekend, evening, and holiday care is
5 provided by GPs employed by the primary care trust. Overnight services are
6 provided by a private provider. Initially we invited all 62 GPs who regularly worked in
7 the OOH service organised by the PCT. We asked them to participate in 30-minute
8 interviews about two recently seen OOH cases. Information about the study was
9 kept to a minimum to reduce respondent bias. We obtained positive responses from
10 29 (47%), and interviewed 21 (34%) GPs, who provided a total of 42 cases. Four
11 GPs had been in practice < 5 years, nine for 5–20 years and eight for >20 years
12 (range <1 year to 37 years).
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23 **Design and data collection**

24 To provide face validity to our findings we used recently seen cases; rather than
25 case vignettes in a laboratory setting. Participants were asked to describe the
26 presentation of two new patients who had consulted with them during their most
27 recent OOH session, and interviewed within 48 hours of their session. They were
28 asked to discuss a straightforward case and a more demanding one. After the first
29 few interviews it became apparent all straightforward cases offered were young
30 children with diarrhoea or raised temperature. Subsequent interviews excluded this
31 group of presentations. Most GPs referred to computer printouts of the cases during
32 the interviews. All interviews, conducted by a single researcher (JIB), were analysed,
33 audio-taped and transcribed. The GPs were asked to describe the presentation of
34 the patient and told that there would be interruptions to clarify what went on in their
35 mind during the consultation. The semi-structured interviews used open-ended
36 questions and focused on each step of the model. [5]
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50 **Data analysis**

51 The audiotapes were used to develop brief typed summaries of each case to gain a
52 sense of the processes, these were then used to build a structure for the analysis.
53 This was carried out with NVivo software. Two researchers searched the text
54 independently for underlying themes in relation to our conceptual framework.
55 Categories were coded according to emerging themes and added to or changed as
56 new concepts emerged. [9] Any differences in interpretation were discussed and
57 consensus was reached on clustering to common themes.
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5 We divide the results into five areas: (1) the participants' perceptions of the OOH
6 environment and its impact on practice, (2) characteristics of a case to make it
7 straightforward or demanding; (3) the process of reasoning in this context; (4)
8 prerequisites for diagnostic closure, (5) learning points from OOH consultations for
9 GP trainees. Within each area we report on common themes raised by the
10 participants.
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17 **Results**

18 All participants indicated that our questions were easy to understand and many
19 remarked that it was a good way for them to reflect on their practice. The analysis
20 was consistent with previous findings on the dual process of reasoning, where
21 instant recognition, followed by reasoning and value judgments lead to a search for a
22 limited number of cues prior to diagnostic closure. (Direct quotes from the interviews
23 appear in italics.)
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32 **1. Key perceptions of OOH environment and its impact on practice**

33 The most powerful themes to emerge related to dealing with urgent potentially high
34 risk cases, trying to keep patients out of hospital, the concept of 'fire fighting', time
35 pressures and working in an unfamiliar environment (Box 1a). This challenging
36 environment impacted on their practice in a number of ways. It was often difficult to
37 work out whose agenda they had to deal with, the patient's or concerned relatives or
38 carers who had contacted the OOH service. Their approach to the patient was to
39 deal with immediate problems only, rather than the usual holistic approach, as
40 described by one GP: *basically you've got to decide whether this chap is safe*. Lack
41 of feedback and follow-up was the rule: *you don't really tend to get any feedback at*
42 *all unless something has gone horrendously wrong* (Box 1b).
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53 **2. What makes a case straightforward or demanding?**

54 There were a number of well-defined characteristics which made presentations easy
55 or difficult to deal with. The focus was very much on illness severity, and a severely
56 ill patient was seen as straightforward, as they just required hospital transfer: *It's*
57 *easy when somebody is terribly unwell....going to admit them to hospital*. Elderly
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3 patients were often difficult because of the complex nature of multiple pre-existing
4 diseases in the absence of background information. Children and young adults were
5 seen as straightforward with well-defined single conditions: *Easy cases tend to be*
6 *younger people with less complicated medical histories and where serious things are*
7 *less common.* Familiarity with the condition helped, whilst falling between the two
8 extremes tended to lead to lack of confidence (Box 2).

16 3. The process of clinical reasoning

17 In most cases, there were instantaneous formulations, for instance, on seeing a two
18 year old child with two days of fever, runny nose, coughing and pulling her left ear:
19 *the likelihood is that it was probably a upper respiratory tract infection..with otitis*
20 *media.* The salient features that brought these to mind were generally recognised:
21 *had all the signs of a grizzly toddler tugging at the left ear, yep have to exclude an*
22 *otitis media.* An inability to make such instantaneous judgment made the case
23 difficult and required data clarification which was not always achieved. Once
24 presentation issues were clarified, early formulations were associated with brief lists,
25 generally headed by the most high risk clinical conditions. This drove the search for
26 one or two critical cues to rule out these. There was a particular focus on red flags
27 which potentially indicated severe illness: *she's quite dry....her oxygen saturation is a*
28 *little bit low.. I'm really thinking about, is this lady compromised because of her*
29 *diarrhoea?* (Box 3).

43 4. Prerequisites for diagnostic closure

44 Diagnostic closure occurs when the clinician stops immediate data collection and
45 makes a management decision based on the available information. A rule of thumb
46 used by one GP defined the issue: *dividing people into two groups....on the basis of*
47 *one question: is it serious or potentially serious or not?* Confidence to stop and
48 make a decision was then assessed using a number of criteria as in Box 4.

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Confidence that appropriate threshold had been reached was rarely stated
numerically by participants, and when asked to assess this way it was generally over
90%, but some were not willing to go beyond a descriptive assessment. As a
prerequisite to closure, GPs depended on a combination of three criteria being met:

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3 1. Confidence in ruling out a list of diseases, with clarity about illness severity: *I'd*
4 *reached the end of what I could do.* 2. Meeting patient's needs: *I'd relieved the*
5 *patient's anxiety that was the main issue at stake.* 3. An ability to set up a good
6 safety net: *a gold star safety net in this case.* This is described as particularly
7 important in emergency settings where diagnostic uncertainty is prominent and the
8 patient's condition may deteriorate unexpectedly. [10] It was consistently stressed
9 during our interviews: *mum was,...supportive,...safety netting was pretty major,* and
10 as a consequence, GPs went to great lengths to set one up if necessary.
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19 **5. Learning points for GP trainees**

20 This was the last question we asked about each case. It turned out to be particularly
21 useful as it gave GPs time to pause and reflect on what they regarded as particularly
22 significant training issues relating to that consultation. Emerging themes divided into
23 (1) training needs on how to deal with patients, stressing the need to develop rapport
24 despite the intense time pressures; (2) learning to deal with uncertainty: *think about*
25 *how certain am I, how certain do I need to be to send him home;* and (3) learning
26 about common presentations with a focus on critical cues to exclude severe illness
27 and a few high risk diseases: *what are the danger signs you would look out for;*
28 *specific symptom questions you want to ask* (Box 5).
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39 **Discussion**

40 To our knowledge this is the first study to show how the context of OOH practice
41 impacts on the clinical reasoning process in primary care. Participants were aware
42 their behaviours and decisions were affected by the environment. In line with the
43 perceived purpose of OOH care, objectives were to keep patients safe, respond to
44 their needs, and reduce unnecessary hospital attendances. Their expectation was to
45 deal with urgent and potentially high risk issues only, avoiding hospital admissions
46 unless patients were at unacceptable risk.
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55 GPs found practice in OOH rewarding, but identified a number of issues which made
56 this a high risk clinical environment. The most prominent of these include a lack of
57 background information in the form of medical records, and complex multisystem
58 chronic disease presentations where it was difficult to define the pertinent issues.
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3 Success depended on clinical skills to develop rapport with patients and recognise
4 their concerns. Lack of regular feedback on clinical performance was raised
5 repeatedly.
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10 Even before GPs knew the presenting complaint, they were constantly on the
11 lookout for severe illness, using red flags and well tried markers of systemic illness.
12 Lists and markers were derived from personal experience and the novice would
13 struggle in their absence. The major driver was to exclude serious disease and
14 severe illness. Ruling out is commonly used in everyday practice, [11] but it was
15 practically uniform in OOH. It was surprising how often this was seen as 'working
16 backwards rather than forwards'. Ruling in first was used only occasionally, in
17 straightforward familiar presentations and then followed by ruling out in most cases.
18 Once serious disease, severe illness or the risk of abrupt deterioration were
19 excluded, the precise diagnosis became less important and could be left for another
20 day.
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31 Diagnostic closure occurs after a clinician has weighed up all the options, and needs
32 to choose a specific course of action. This is the point where clinical errors crystallise
33 and therefore understanding the rules and thresholds for stopping, provides insights
34 into the causes of diagnostic error. Little is known about how diagnostic closure
35 occurs in most clinical specialties and settings, including primary care. The OOH
36 setting provided a unique opportunity to gain insights into diagnostic closure, as
37 clinical care is associated with clear-cut endpoints, not often seen in other practice
38 settings. The stopping rules used by GPs involved three criteria: firstly, have high
39 risk conditions and severe illness that require urgent hospital attention been
40 excluded? Secondly, have I responded directly to the patient's needs? Thirdly, is
41 there a reliable safety net in place, given the high risk environment where error may
42 be more likely than in a familiar situation?
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53 The basis of individualised judgments about acceptable confidence levels for the
54 stopping rules were difficult to define and as one GP put it '*feels like a nebulous*
55 *thing*'. This is consistent with a previous study, which used an end point of variation
56 in hospital referral rates and concluded that the individual nature of learning from
57 experience leads to a variation in approach to risk tolerance and associated
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3 confidence levels for decision making. [12] We believe that our findings are
4 consistent with the work of Gabbay and le May, [13] who suggested that multiple
5 exposures to clinical experience, embedded in a social context lead to a set of
6 'internalised, collectively reinforced and often tacit guidelines...malleable to deal both
7 with individual patients' needs and the multifarious factors that come into reckoning
8 when making decisions.'
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17 **Strengths and limitations of the study**

18 This is the first study that we are aware of that has explicitly explored the diagnostic
19 reasoning that occurs in OOH primary care, and is likely to be relevant to other
20 countries with similar systems of primary care. The design of the study is based on a
21 strong theoretical framework provided by the dual theory of cognition. This has been
22 shown to have generalisability to human reasoning irrespective of the domain. [6]
23 There are also good theoretical models suggesting that clinical thinking can be
24 modelled within this framework. [8] The study also has face validity using recently
25 seen cases, where participants were not made aware of the content and purpose of
26 the interviews.
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36 Limitations relate primarily to sampling. Participants were not chosen at random, but
37 consisted of self-selected individuals who made up a third of a cohort we
38 approached. This is an almost universal problem with studies that involve busy and
39 senior clinicians. We asked participants to select the two most recently seen patients
40 who met the selection criteria. We cannot be certain if these rules were always
41 applied. We have not performed similar patient based studies in other settings in the
42 UK or in countries with different health systems and to this stage the research has
43 not included other specialty groups. We believe that on account of the strong
44 theoretical base, the findings, albeit with different emphases, are likely to have
45 generalisability to other specialties and health systems. There are concerns
46 regarding the validity of think aloud protocols, but they have been considered
47 appropriate for studies of cognition in natural settings as used here. [14]
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59 **Implications for practice**

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3 High quality OOH care is important to the functioning of the health service, and
4 particularly the interface between primary care, emergency care and acute hospital
5 care. While the results of our investigation provide a unique insight into the clinical
6 decision making that occurs in OOH, we have several practical recommendations
7 based on our research which could potentially be implemented with minimal
8 additional resources. Our findings also draw attention to the ongoing difficulties in
9 accessing GP or hospital records from OOH settings; a situation which we
10 acknowledge is unlikely to change without the continued significant investment in
11 NHS IT infrastructure.
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21 Firstly, at the organisational level an automated, regular and timely system of
22 feedback to GPs and other clinical staff practising in the OOH setting is essential.
23 Providing clinical care in an environment almost devoid of clinical feedback (apart
24 from when there are complaints or serious events) is contrary to the type of practice
25 that GPs are trained to work in. One of the mainstays of primary care practice is the
26 longitudinal relationship with patients, so that information gathering and clinical
27 decision making occur over several encounters. In the OOH setting, this process
28 becomes compressed, and is compounded by high patient flow. Since the vast
29 majority of OOH care is provided by local GPs and other staff, an initial step would
30 be to provide routine feedback on the outcomes of their clinical decisions. Since
31 most OOH services are now computerised, this could be implemented with little
32 additional resource. It would also provide material for GPs to use as part of
33 validation, and by employers to potentially compare outcomes between staff.
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35 Secondly, for the individual, in line with the principles of fruitful learning from
36 experience, we suggest that peer and expert clinician support with regular meetings
37 and feedback on recent cases could be implemented. [15] GPs would then be in a
38 position to reflect, calibrate their decision making and update their mental constructs,
39 all necessary for good practice. Some GPs noted that they previously had used
40 informal coffee breaks to do this, but the increasing numbers of patients attending
41 OOH now precluded this. However, such informal systems are probably inadequate,
42 and we propose that OOH practice should incorporate formal opportunity for
43 reflection. Thirdly, our research has implications for training GPs, whose requirement
44 for OOH training and experience is fairly modest. Individual mentoring and group
45 discussions need to focus on (1) how to develop rapport with new and anxious
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3 patients; (2) how to deal with uncertainty; and (3) common presentations with a focus
4 on critical cues to exclude severe illness and the relatively few high risk diseases.
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8 9 **Implications for future research**

10 We recognise that our study is a starting point for further research in this area. To
11 explore the generalisability of our findings to other OOH or alternative emergency
12 settings, our studies will need to be replicated with appropriate cohorts of GPs and
13 other clinicians working in such environments. We do not know if the practice
14 changes that we propose will lead to better clinical care and this needs separate
15 evaluation. Finally, investigation of the rules clinicians use for diagnostic closure may
16 give us insights into the root causes of clinical error.
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24 25 **Conclusions**

26 This study provides the first evidence of how working in an OOH environment
27 impacts on clinical reasoning and decision making. GPs identify OOH as a
28 potentially high risk clinical environment and adapt their practice approach to this
29 setting. Lack of access to GP or hospital records is a major concern. Our study
30 suggests that improving feedback to GPs about their clinical decisions and providing
31 opportunities for reflection on OOH practice would be valuable for ongoing review
32 and improvement of clinical practice. The findings provide guidance to the
33 development of GP training programs to cover the specific needs of OOH. Exploring
34 further the rules and criteria that clinicians use for diagnostic closure may give us
35 insights into the root causes of clinical error.
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Box 1a: Participants' perceptions of OOH environment (quotes in italics, numeric refers to interviewee ID). Emerging themes to question: *How is the OOH environment different from normal practice and how does it impact on your practice?* Frequently these comments came up spontaneously.

Theme	Example
Avoiding hospital referral	<i>avoid hospital .. indication [to refer only if] either further assessment is required or there is some definite intervention that the hospital can provide (11); intravenous fluids which of course can't be given in the GP context (13);</i>
Fire fighting	<i>only deal with the immediate situation that's sort [of] a bit of fire fighting (12);</i>

	<i>acute presentation ... the key to that consultation was excluding (17);</i>
Time pressure	<i>not doing the other patients a service if they are sitting out there waiting (19);</i>
Practising in an unfamiliar environment	<i>easier to practise medicine in your own environment (5);</i>
High risk patients	<i>see a high proportion of high risk patient in out of hours...frightening sometimes (21);</i>

Box 1b: Impact of OOH environment on practice

Theme	Examples
Lack of background information & lack of clarity about agenda	<i>Challenging because you don't know the patients (9); whose agenda? (6); you don't have access to the records (16);</i>
Special problems	<i>psychiatry always difficult... my worry was whether she was suicidal (14);</i>
Approach to patient	<i>I'm not quite so patient centred .. a bit of fire fighting ...don't want to miss critical things and if there's a red flag symptom that comes up ...[it] doesn't need to be acted upon (15);</i>
Lack of follow-up	<i>The sad thing about out of hours is that you don't follow up on most of your patients (18);</i>
Lack of feedback	<i>you don't really tend to get any feedback at all unless</i>

	<i>something has gone horrendously wrong (18);</i>
Attitude to work	<i>a rewarding part of my work... best provided by experienced general practitioners (11);</i>

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Box 2. Key themes to differentiate between straightforward and demanding presentations. Question: *Can you explain why you felt that Case 1 was straightforward and second one more demanding or difficult?* (S: straightforward, D: demanding)

Theme	Example
Salient feature rapidly recognised or unclear	<p>S: <i>fine within about one minute of seeing the baby just by looking (3);</i></p> <p>D: <i>vague and there was sort of lack of symptoms a lack of I suppose a good history (4);</i></p>
Familiar or not	<p>S: <i>just the run of the mill you know straight forward diagnosis that you see commonly everyday (10);</i></p> <p>D: <i>uncomfortable because I had not seen a rash quite like that before(7);</i></p>
Age group	<p>S: <i>Easy cases tend to be younger people with less complicated medical histories and where serious things are less common (16);</i></p> <p>D: <i>chronic ongoing problems where lots of doctors (16);</i></p>
Degree of ongoing uncertainty	<p>S: <i>it's about the degree of risk that I take .. it is about the degree of confidence that I have whether I can help them or not (14);</i></p> <p>D: <i>I had a degree of uncertainty about the second case that I didn't have about the first one (12);</i></p>
Severity of illness	<p>S: <i>It's easy when somebody is terribly unwell..going to admit them to hospital (16); If not serious, may or may not know the diagnosis but does not matter (6); you cannot make a definite diagnosis, no red flags (13);</i></p> <p>D: <i>more difficult I think the fact that there was a longer differential .. the stakes were higher ... I had a degree of uncertainty (12);</i></p>

Box 3: Process of reasoning in this context. Question: *Can you describe what was the main driver of the process?* Often these statements were made spontaneously during the interview. (Digit after stop refers to 1st or 2nd case for interviewee.)

Themes	Example
Clarify issues, and whose agenda to deal with first	<p>S: <i>think firstly you have to identify what the real issue is (6.1);</i></p> <p>D: <i>firstly, what real issue is, in OOH may be very problematic (1.2); too vague to formulate any thoughts (4.2);</i></p>
Looking for critical cues and red flags	<p>S: <i>my main concern then was about her hydration (15.1);</i></p> <p>D: <i>Especially fast resp rate without infection (1.2); wanted to establish that she was not confused (2.2);</i></p>
Process of ruling out serious illness first	<p>S: <i>I sort of work backwards rather than forwards and so I want to rule out the serious things (16.2); I want to make sure they are systemically well (15.1);</i></p> <p>D: <i>First thing was likely to be the usual just rule out anything serious (1.1);</i></p>
Process of ruling in common and safe condition	<p>S: <i>rule in, since nil high risk (4.1); purpose was to confirm the diagnosis which she had given me looking for evidence to support .. hypothesis (12.1);</i></p> <p>D: <i>initially I started with a net looking for the common causes (17.2); getting to the correct diagnosis and keeping her safe (20.2);</i></p>
Reassure patient and carers	<p>S: <i>addressing the patient's concerns (15.1);</i></p> <p>D: <i>my main concern was safety,.. how could I keep her as safe as possible while trying to respect her autonomy (10.2);</i></p>
Risk assessment	<p>S: <i>[ketotic pregnant woman]: probably 90% certain that it was a urine infection, I would say 100% certain in this particular case that admission was needed (13.); I was just slightly concerned that he was starting something more serious so I said if his temperature went up persistently .. or if he became breathless ..he should contact back again and that there was somebody on the out of hours all weekend (14.1);</i></p> <p>D: <i>err on the side of caution .. threshold to me feels like a fairly nebulous thing .. the clinical state of the patient was surprisingly good (5.2); I was reasonably confident .. there was this possibility that we would be able to [treat] her orally (11.2);</i></p>
Used another opinion	<p><i>well I actually got somebody else in to have a look at it (7.2); speaking to the medical registrar at the hospital .. the other</i></p>

	<i>deciding factor (10.2);</i>
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Box 4. Prerequisites for closure of diagnostic process. Question: *Can you try and explain what made you stop the process at this particular stage?*

Themes	Example
Perception of patient systemically well or unwell	Well: <i>I didn't think she was medically kind of unwell (4); vital signs were good (13);</i> Unwell: <i>She looked ill and she was vomiting profusely (19);</i>
Ruled out urgent or severe illness	<i>urgent problems .. excluded ..don't really know what's going on now, but I didn't think it was anything serious (3); I felt I'd done more excluding than I had done confirming (17);</i>
Ruled in non-urgent diagnosis with satisfactory confirmation	<i>know it's to be one of the simpler things but you have to ask the questions, and I guess how much is enough I mean at the point when I'm satisfied that there is significantly more confirmation of one of the simpler things than one of the nasties (5); the history and the examination coalesce on a simple diagnosis (11);</i>
Red flags present or absent	<i>ketotic .. don't think I could have done anything else (13); her gait was staggering (21);</i>
Set up good safety net	<i>mum was ..supportive ..safety netting was pretty major(9); a gold star safety net in this case ...driver knew the patient (2);</i>
Responded to patient's needs	<i>I'd relieved the patient's anxiety that was the main issue at stake .. in terms of the diagnosis I think I was less than 50% sure.. , but in terms of what was best to do for the patient ... towards 100% (18); I hadn't succeeded in allaying his anxieties (6);</i>

Box 5: Trainee take home messages. Answers in response to question: *What sort of message would you like your trainee to take home from this consultation?*

Theme	Example
Patient related issues	<i>Take time to establish a rapport (2); listen to the patient's concerns (15);</i>

Case specific learning	<i>this is how chest infections present in the elderly (3); common things that can cause sudden deterioration in elderly patients (13); what are the danger signs you would look out for (10); specific symptom questions you want to ask (12);</i>
The process	<i>looking at the global perspective of the child (1); I said to him look I really don't find signs of anything serious or anything potentially serious just now (6); the take home message is the safety net (5);</i>
Dealing with uncertainty	<i>uncertainty...sometimes you don't know .. talk them through the probability side of things I would discuss the things that lead me towards one way or another (7);</i>

Competing interests : No competing interests have been declared by the authors.

Contributorship statement:

John Balla designed the study, conducted the interviews, analysed the data, produced the first draft to final document.

Carl Heneghan and **Matthew Thompson** conceived the project and were involved with design and all stages of writing the drafts and final document.

Margaret Balla participated in the interviews and analysis as well as reviewing the drafts.

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Clinical decision making in a high risk primary care environment: a qualitative study in the UK

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COREQ guidelines table

Domain 1: Research team and reflexivity			Comment
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview?	JB and MB
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i>	FRCPE, MA
3.	Occupation	What was their occupation at the time of the study?	Research Fellows
4.	Gender	Was the researcher male or female?	1 male/1 female
5.	Experience and training	What experience or training did the researcher have?	>30 years qualitative research
Relationship with participants			Nil
6.	Relationship established	Was a relationship established prior to study commencement?	With some of them
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i>	Broad outlines given .
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i>	Reasons for research and interest in training
Domain 2: study design			
Theoretical framework			

COREQ guidelines table

9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>	Content analysis
Participant selection			
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i>	Convenience
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i>	Email and face-to-face
12.	Sample size	How many participants were in the study?	21
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	66% of those approached not interviewed for lack of time or interest
Setting			
14.	Setting of data collection	Where was the data collected? <i>e.g. home, clinic, workplace</i>	Clinic for most, 3 at home
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	No
16.	Description of sample	What are the important characteristics of the sample? <i>e.g. demographic data, date</i>	All experienced GPs in active clinical practice
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Pilot tested. Semi-structured interview
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No

COREQ guidelines table

19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Audiotaped
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Yes
21.	Duration	What was the duration of the interviews or focus group?	30 minutes
22.	Data saturation	Was data saturation discussed?	Yes and reached about half way
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	2
25.	Description of the coding tree	Did authors provide a description of the coding tree?	yes
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Both, as we responded to the data
27.	Software	What software, if applicable, was used to manage the data?	Yes
28.	Participant checking	Did participants provide feedback on the findings?	yes
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i>	yes

COREQ guidelines table

30.	Data and findings consistent	Was there consistency between the data presented and the findings?	yes
31.	Clarity of major themes	Were major themes clearly presented in the findings?	yes
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	yes

Summary

Article focus

- Clinical reasoning and decision making in an out of hours primary care setting.
- The aim is to gain insights into how GPs make clinical decisions and manage risk in this environment.
- Implications for system changes and training

Key messages

- Clinical decision making in OOH is dominated by rule-out strategies for severe illness or potentially high risk diseases.
- GPs use three main criteria to determine diagnostic closure: global wellness with rule-outs, responded to patient needs, presence of a reliable safety net.
- Improvements to clinical decision making could be achieved by providing routine feedback to clinical staff working in OOH, building in systems to support reflection on clinical cases, and more tailored GP training.

Strengths and limitations of this study

- The design of the study is based on a strong theoretical framework provided by the dual theory of cognition.
- Face validity through using recently seen cases.
- Limitations relate primarily to sampling, participants consisting of self-selected individuals.

Abstract

Objective Examine clinical reasoning and decision making in an out of hours (OOH) primary care setting to gain insights into how general practitioners (GPs) make clinical decisions and manage risk in this environment.

Design: Semi-structured interviews using open-ended questions.

Setting A two-month qualitative interview study conducted in Oxfordshire, UK.

Participants 21 GPs working in OOH primary care.

Results The most powerful themes to emerge related to dealing with urgent potentially high risk cases, keeping patients safe and responding to their needs, whilst trying to keep patients out of hospital and the concept of 'fire fighting'. There

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3 were a number of well defined characteristics that GPs reported making
4 presentations easy or difficult to deal with. Severely ill patients were straightforward,
5 whilst the elderly, with complex multisystem diseases were often difficult. GPs
6 stopped collecting clinical information and came to clinical decisions when: high risk
7 disease and severe illness requiring hospital attention has been excluded; they had
8 responded directly to the patient's needs; and there was a reliable safety net in
9 place. Learning points that GPs identified as important for trainees in the OOH
10 setting included the importance of developing rapport in spite of time pressures;
11 learning to deal with uncertainty, and learning about common presentations with a
12 focus on critical cues to exclude severe illness.

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14 **Conclusions** Our findings support suggestions that improvements in primary care
15 OOH could be achieved by including automated and regular timely feedback system
16 for GPs, and individual peer and expert clinician support for GPs with regular
17 meetings to discuss recent cases. In addition, trainee support and mentoring to focus
18 on clinical skills, knowledge and risk management issues specific to OOH is currently
19 required. Investigating the stopping rules used for diagnostic closure may provide
20 new insights into the root causes of clinical error in such a high risk setting.
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32 Introduction

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34 Primary care in the UK is provided during weekends, evenings and overnight by
35 various types of out of hours (OOH) services, and it has become a core component
36 of round-the-clock primary care in many countries. Accessible and high quality OOH
37 services provide an important mechanism to reduce service pressures and
38 associated costs from inappropriate use of Emergency Department services.^[1] The
39 majority of OOH care in the UK is provided by general practitioners (GPs), often in
40 conjunction with emergency medical and nursing practitioners, and organised by
41 private providers or primary care trusts. Patients typically initiate contact through a
42 telephone triage system. Those requiring face to face consultations, but not urgent
43 hospital referral, are seen by a GP at a local clinic or in the patient's home.
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53 Patients who contact OOH services are more likely to have acute problems than
54 those who are seen in daytime primary care. Therefore, GPs working in OOH are
55 likely to meet a higher number of acutely ill patients than in their routine practice.
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3 Mostly these are 'new' patients, i.e. presenting to GPs who are unlikely to know them
4 and with little or no access to their GP or hospital records. The combination of lack of
5 continuity and high incidence of acute illness provides a potentially hazardous
6 practice environment, in which errors can occur. [2] Although the incidence of
7 significant clinical error is unknown, high profile adverse incidents have received
8 significant media attention, [3] and prompted a fundamental review of OOH service
9 provision in the UK. [4] Recommendations focussed on clinical governance, more
10 effective performance management, better team work and making patient records
11 more accessible. In addition they have highlighted staff development issues such as
12 the possible use of checklists, regular feedback, improving GP training for the
13 specific demands of OOH and individualised audits.
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23 However, the ways in which GPs make clinical decisions in OOH has received little
24 attention. Yet, how clinical decisions are made under these circumstances is
25 currently unknown, and little is known of the factors that affect safety and referral
26 patterns. We therefore examined clinical reasoning and decision making in an OOH
27 setting, with the aim of gaining insights into how GPs manage risk whilst keeping
28 patients safe in this environment and focussing on factors they may improve the
29 delivery of services.
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37 Methodology

38 Studies of clinical reasoning (CR) describe the reasoning processes employed
39 during a consultation. [5] We have previously published a model of CR based on our
40 work with GPs. [6] The assumption behind the model was that understanding the
41 reasoning process was essential for fruitful reflection on clinical practice. The model
42 highlights key areas of knowledge and critical value judgments that are used in the
43 clinical encounter. We used this model, which is derived from the dual theory of
44 cognition, [7] as the framework for a qualitative study of OOH practice. [8] We are not
45 aware of other studies that have tested the applicability of similar theory-based
46 models to real life consultations, though generic theoretical models have been
47 proposed. [9]
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56 The dual theory posits two systems interacting with each other. The non-analytic
57 System 1 provides the fast response, whilst the reflective System 2 is slow and may
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override the original response. There is rapid recognition of a salient feature of the case,^[10] which may stem from the context provided by what is already known about the patient, physical appearance or critical cues specific to a presentation. This links to pre-existing mental representations, based on theory and experience built up of multiple exposures to similar cases. Whilst some aspects of the salient feature can be described by the clinician, others may appear no more than a 'sense of alarm or reassurance', described as 'gut feelings' by Stolper et al,^[11] which impact on the reasoning and decision making process of GPs. This combination of recognition and gut feelings leads to a limited search for more cues. System 2 represents reasoning through the initial response vis-à-vis the rules provided by the theory of the profession and may lead to correcting or overriding System 1. In cases where there are no salient features perceived System 2 takes over in place of the absent fast response.^[7] The initial judgments provide the frame for the direction of the search for further information. Drivers prioritise the search, generally aimed at risk avoidance with the focus on ruling diagnostic options out or in, through searching for a few highly critical cues that support or negate the original frame. A necessary aspect of this kind of reasoning is a stopping rule for data collection, but we have not been able to find any research that describes them in a clinical setting.^[12]

Setting and cohort

We conducted a two month study in Oxfordshire, UK where OOH care is provided by a combination of different services. Most weekend, evening, and holiday care is provided by GPs employed by the primary care trust. Overnight services are provided by a private provider. Initially we invited all 62 GPs who regularly worked in the OOH service organised by the PCT. We asked them to participate in 30-minute interviews about two recently seen OOH cases. We chose 30 minutes to minimise the pressure on busy work schedules. From past experience, most GPs would be interviewed before or after consulting and often during their brief lunch breaks. The time allocated was deemed sufficient to capture the data on the issues on which we were focused. Information about the study was kept to a minimum to reduce respondent bias. We obtained positive responses from 29 (47%), and interviewed 21 (34%) GPs, who provided a total of 42 cases. Four GPs had been in practice < 5 years, nine for 5–20 years and eight for >20 years (range <1 year to 37 years). In our

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3 experience and in reports in the literature, busy professionals are relatively difficult to
4 persuade to find time for an interview. Therefore one is generally unlikely to find
5 random cohorts, the participants coming through word of mouth and professional
6 contacts. The only variable we would expect to have an impact for this study was
7 length of experience and in this respect our cohort was relatively well represented.
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12 **Design and data collection**

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14 To provide face validity to our findings we used recently seen cases; rather than
15 case vignettes in a laboratory setting. Participants were asked to describe the
16 presentation of two new patients who had consulted with them during their most
17 recent OOH session, and interviewed within 48 hours of their session. They were
18 asked to discuss a straightforward case and a more demanding one. After the first
19 few interviews it became apparent all straightforward cases offered were young
20 children with diarrhoea or raised temperature. Subsequent interviews excluded this
21 group of presentations. Most GPs referred to computer printouts of the cases during
22 the interviews. All interviews, conducted by a single researcher (JIB), were analysed,
23 audio-taped and transcribed. The GPs were asked to describe the presentation of
24 the patient and told that there would be interruptions to clarify what went on in their
25 mind during the consultation. The semi-structured interviews used open-ended
26 questions and focused on each step of the model.^[6] (Box 1)
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38 The literature suggests that the greatest impact on decision making occurs at the
39 first step which frames the direction of the process and at the final step of diagnostic
40 closure when immediate data collection stops and where most of the errors are likely
41 to occur.^{[13][14]} Our focus for the first step was to what extent GPs could describe the
42 salient feature that would lead to recognition of the case. We specifically did not
43 attempt to dig deeper or look for gut feelings, at the same time acknowledging their
44 prominence in the diagnostic process. On the other hand, we explored these
45 instinctive aspects at the stage of closure. This relates to our particular interest in
46 this step. The scope of the study would not allow us a full exploration of all facets of
47 each step.
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55 **Data analysis**

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3 The audiotapes were used to develop brief typed summaries of each case to gain a
4 sense of the processes; these were then used to build a structure for the analysis.
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6 This was carried out with NVivo software. Two researchers searched the text
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8 independently for underlying themes in relation to our conceptual framework.
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10 Categories were coded according to emerging themes and added to or changed as
11 new concepts emerged. ^[15] Any differences in interpretation were discussed and
12 consensus was reached on clustering to common themes.
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16 We divide the results into five areas: 1) the participants' perceptions of the OOH
17 environment and its impact on practice, 2) characteristics of a case to make it
18 straightforward or demanding; 3) the process of reasoning in this context; 4)
19 prerequisites for diagnostic closure, 5) learning points from OOH consultations for
20 GP trainees. Within each area we report on common themes raised by the
21 participants.
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27 28 **Results**

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30 All participants indicated that our questions were easy to understand and many
31 remarked that it was a good way for them to reflect on their practice. The analysis
32 was consistent with previous findings on the dual process of reasoning, where
33 instant recognition, followed by reasoning and value judgments lead to a search for a
34 limited number of cues prior to diagnostic closure. (Direct quotes from the interviews
35 appear in italics.)
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41 **1. Key perceptions of OOH environment and its impact on practice**

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43 The most powerful themes to emerge related to dealing with urgent potentially high
44 risk cases, trying to keep patients out of hospital, the concept of 'fire fighting', time
45 pressures and working in an unfamiliar environment (Box 1a). This challenging
46 environment impacted on their practice in a number of ways. It was often difficult to
47 work out whose agenda they had to deal with, the patient's or concerned relatives or
48 carers who had contacted the OOH service. Their approach to the patient was to
49 deal with immediate problems only, rather than the usual holistic approach, as
50 described by one GP: *basically you've got to decide whether this chap is safe*. Lack
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3 of feedback and follow-up was the rule: *you don't really tend to get any feedback at*
4 *all unless something has gone horrendously wrong* (Box 1b).
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8 **2. What makes a case straightforward or demanding?**

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10 There were a number of well-defined characteristics which made presentations easy
11 or difficult to deal with. The focus was very much on illness severity, and a severely
12 ill patient was seen as straightforward, as they just required hospital transfer: *It's*
13 *easy when somebody is terribly unwell....going to admit them to hospital.* Elderly
14 patients were often difficult because of the complex nature of multiple pre-existing
15 diseases in the absence of background information. Children and young adults were
16 seen as straightforward with well-defined single conditions: *Easy cases tend to be*
17 *younger people with less complicated medical histories and where serious things are*
18 *less common.* Familiarity with the condition helped, whilst falling between the two
19 extremes tended to lead to lack of confidence (Box 2).
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28 **3. The process of clinical reasoning**

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30 In most cases, there were instantaneous formulations, for instance, on seeing a two
31 year old child with two days of fever, runny nose, coughing and pulling her left ear:
32 *the likelihood is that it was probably a upper respiratory tract infection..with otitis*
33 *media.* The salient features that brought these to mind were generally recognised:
34 *had all the signs of a grizzly toddler tugging at the left ear, yep have to exclude an*
35 *otitis media.* An inability to make such instantaneous judgment made the case
36 difficult and required data clarification which was not always achieved. Once
37 presentation issues were clarified, early formulations were associated with brief lists,
38 generally headed by the most high risk clinical conditions. This drove the search for
39 one or two critical cues to rule out these. There was a particular focus on red flags
40 which potentially indicated severe illness: *she's quite dry....her oxygen saturation is a*
41 *little bit low.. I'm really thinking about, is this lady compromised because of her*
42 *diarrhoea?* (Box 3).
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54 **4. Prerequisites for diagnostic closure**

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56 Diagnostic closure occurs when the clinician stops immediate data collection and
57 makes a management decision based on the available information. A rule of thumb
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3 used by one GP defined the issue: *dividing people into two groups....on the basis of*
4 *one question: is it serious or potentially serious or not?* Confidence to stop and
5 make a decision was then assessed using a number of criteria as in Box 4.
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10 Confidence that appropriate threshold had been reached was rarely stated
11 numerically by participants, and when asked to assess this way it was generally over
12 90%, but some were not willing to go beyond a descriptive assessment. As a
13 prerequisite to closure, GPs depended on a combination of three criteria being met:
14 1) Confidence in ruling out a list of diseases, with clarity about illness severity: *I'd*
15 *reached the end of what I could do.* 2) Meeting patient's needs: *I'd relieved the*
16 *patient's anxiety that was the main issue at stake.* 3) An ability to set up a good
17 safety net: *a gold star safety net in this case.* This is described as particularly
18 important in emergency settings where diagnostic uncertainty is prominent and the
19 patient's condition may deteriorate unexpectedly.^[16] It was consistently stressed
20 during our interviews: *mum was,..supportive,..safety netting was pretty major,* and as
21 a consequence, GPs went to great lengths to set one up if necessary.
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31 **5. Learning points for GP trainees**

32 This was the last question we asked about each case. It turned out to be particularly
33 useful as it gave GPs time to pause and reflect on what they regarded as particularly
34 significant training issues relating to that consultation. Emerging themes divided into
35 1) training needs on how to deal with patients, stressing the need to develop rapport
36 despite the intense time pressures; 2) learning to deal with uncertainty: *think about*
37 *how certain am I, how certain do I need to be to send him home;* and 3) learning
38 about common presentations with a focus on critical cues to exclude severe illness
39 and a few high risk diseases: *what are the danger signs you would look out for;*
40 *specific symptom questions you want to ask* (Box 5).
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49 **Discussion**

50 To our knowledge this is the first study to show how the context of OOH practice
51 impacts on the clinical reasoning process in primary care. Participants were aware
52 their behaviours and decisions were affected by the environment. In line with the
53 perceived purpose of OOH care, objectives were to keep patients safe, respond to
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3 their needs, and reduce unnecessary hospital attendances. Their expectation was to
4 deal with urgent and potentially high risk issues only, avoiding hospital admissions
5 unless patients were at unacceptable risk.
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10 GPs found practice in OOH rewarding, but identified a number of issues which made
11 this a high risk clinical environment. The most prominent of these include a lack of
12 background information in the form of medical records, and complex multisystem
13 chronic disease presentations where it was difficult to define the pertinent issues.
14 Success depended on clinical skills to develop rapport with patients and recognise
15 their concerns. Lack of regular feedback on clinical performance was raised
16 repeatedly.
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23 **Our findings were consistent with the dual theory of cognition. In line with System 1,**
24 **there was instant recognition on finding salient features of the presentation.** Even
25 before GPs knew the presenting complaint, they were constantly on the lookout for
26 severe illness (Boxes 1a and 2), using red flags (Box 3), and well-trying markers of
27 systemic illness (Box 4). Lists and markers were derived from personal experience
28 and the novice would struggle in their absence (Box 5). **These early cues would**
29 **frame the immediate search for further cues.** The major driver was to exclude
30 serious disease and severe illness (Box 3). Ruling out is commonly used in everyday
31 practice^[17] but it was practically uniform in OOH. It was surprising how often this
32 was seen as 'working backwards rather than forwards'. **System 2 which represents**
33 **correcting or overriding System1 was used in many but not all cases.** For instance,
34 ruling in first was used only occasionally, in straightforward familiar presentations
35 and then followed by ruling out in most cases. Once serious disease, severe illness
36 or the risk of abrupt deterioration were excluded, the precise diagnosis became less
37 important and could be left for another day. **Such decisions, as they often required**
38 **reflection, represented System 2.** Diagnostic closure which occurs after a clinician
39 has weighed up all the options and needs to choose a specific course of action, in all
40 but the most clear-cut presentation would involve such reflection (Box 4). This is the
41 point where clinical errors crystallise and therefore understanding the rules and
42 thresholds for stopping, provides insights into the causes of diagnostic error. Little is
43 known about how diagnostic closure occurs in most clinical specialties and settings,
44 including primary care. The OOH setting provided a unique opportunity to gain
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3 insights into diagnostic closure, as clinical care is associated with clear-cut
4 endpoints, not often seen in other practice settings. The stopping rules used by GPs
5 involved three criteria: firstly, have high risk conditions and severe illness that require
6 urgent hospital attention been excluded? Secondly, have I responded directly to the
7 patient's needs? Thirdly, is there a reliable safety net in place, given the high risk
8 environment where error may be more likely than in a familiar situation?
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15 The basis of individualised judgments about acceptable confidence levels for the
16 stopping rules were difficult to define and as one GP put it '*feels like a nebulous*
17 *thing*'. This is consistent with a previous study, which used an end point of variation
18 in hospital referral rates and concluded that the individual nature of learning from
19 experience leads to a variation in approach to risk tolerance and associated
20 confidence levels for decision making.^[18] We believe that our findings are consistent
21 with the work of Gabbay and le May,^[19] who suggested that multiple exposures to
22 clinical experience, embedded in a social context lead to a set of 'internalised,
23 collectively reinforced and often tacit guidelines...malleable to deal both with
24 individual patients' needs and the multifarious factors that come into reckoning when
25 making decisions.'
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35 **Strengths and limitations of the study**

36 This is the first study that we are aware of that has explicitly explored the diagnostic
37 reasoning that occurs in OOH primary care, and is likely to be relevant to other
38 countries with similar systems of primary care. The design of the study is based on a
39 strong theoretical framework provided by the dual theory of cognition. This has been
40 shown to have generalisability to human reasoning irrespective of the domain.^[7]
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42 There are also good theoretical models suggesting that clinical thinking can be
43 modelled within this framework.^[9] The study also has face validity using recently
44 seen cases, where participants were not made aware of the content and purpose of
45 the interviews.
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51 Limitations relate to a number of issues. 1) **Sampling:** Participants were not chosen
52 at random, but consisted of self-selected individuals who made up a third of a cohort
53 we approached. This is an almost universal problem with studies that involve busy
54 and senior clinicians. We asked participants to select the two most recently seen
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3 patients who met the selection criteria. We cannot be certain if these rules were
4 always applied. We have not performed similar patient based studies in other
5 settings in the UK or in countries with different health systems and to this stage the
6 research has not included other specialty groups. 2) There are concerns regarding
7 the validity of think aloud protocols, but they have been considered appropriate for
8 studies of cognition in natural settings as used here.^[20] 3) We designed the study to
9 allow us to focus on specified steps of the clinical reasoning process, e.g. closure.
10 This means that some steps could not have full coverage of issues, such as some of
11 the crucial intuitive aspects of the early stages of diagnosis. This will require further
12 qualitative work. 4) Another issue relates to triangulation. These qualitative studies
13 lead to the development of inventories suitable for triangulation through quantitative
14 studies.
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16 We believe that the dual theory of cognition is the closest model to how people
17 actually think in real life scenarios and this makes it an appropriate way to study
18 reasoning in a clinical setting.^[13] On account of the strong theoretical base, our
19 findings, albeit with different emphases, are likely to have some degree of
20 generalisability to other specialties and health systems.
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23 Implications for practice

24 High quality OOH care is important to the functioning of the health service, and
25 particularly the interface between primary care, emergency care and acute hospital
26 care. While the results of our investigation provide a unique insight into the clinical
27 decision making that occurs in OOH, we have several practical recommendations
28 based on our research which could potentially be implemented with minimal
29 additional resources.
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32 Recognising the limitations of our study, we also find that our conclusions are
33 consistent with the literature on the importance of feedback on performance and
34 settings for fruitful reflection on experience. We believe that given this congruence
35 between the relevant literature and our proposals, our recommendations merit
36 cautious acceptance and evaluation.
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39 Firstly, at the organisational level an automated, regular and timely system of
40 feedback to GPs and other clinical staff practising in the OOH setting is essential.
41 Providing clinical care in an environment almost devoid of clinical feedback (apart
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3 from when there are complaints or serious events) is contrary to the type of practice
4 that GPs are trained to work in. One of the mainstays of primary care practice is the
5 longitudinal relationship with patients, so that information gathering and clinical
6 decision making occur over several encounters. In the OOH setting, this process
7 becomes compressed, and is compounded by high patient flow. Since the vast
8 majority of OOH care is provided by local GPs and other staff, an initial step would
9 be to provide routine feedback on the outcomes of their clinical decisions. Since
10 most OOH services are now computerised, this could be implemented with little
11 additional resource. **These systems need to be implemented with sensitivity,**
12 **recognising the risk of creating anxiety and dislike of being monitored. Feedback**
13 **needs to be seen as non-judgmental and to be used by the recipient and trusted**
14 **colleagues only. The importance of regular feedback on performance to gain**
15 **expertise is well accepted in the literature.** [21]

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25 Secondly, for the individual, in line with the principles of fruitful learning from
26 experience, we suggest that peer and expert clinician support with regular meetings
27 and feedback on recent cases should be implemented. **The educational literature**
28 **provides good evidence that practice with feedback enhances deep learning which**
29 **goes with improved understanding of subject matter.** [22] GPs would then be in a
30 position to reflect, calibrate their decision making and update their mental constructs,
31 all necessary for good practice. Some GPs noted that they previously had used
32 informal coffee breaks to do this, but the increasing numbers of patients attending
33 OOH now precluded this. However, such informal systems are probably inadequate,
34 and **we propose that OOH practice should experiment with formal opportunities for**
35 **reflection in a safe and supportive environment.**

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45 Thirdly, our research has implications for training GPs, whose requirement for OOH
46 training and experience is fairly modest. Individual mentoring and group discussions
47 need to focus on 1) how to develop rapport with new and anxious patients; 2) how to
48 deal with uncertainty; and 3) common presentations with a focus on critical cues to
49 exclude severe illness and the relatively few high risk diseases. **We believe that the**
50 **model of deliberate practice as described by Ericsson,** [23] **is likely to be a suitable**
51 **model for training. .The clinician seeks out cases in areas of perceived weakness**
52 **and practice is associated with immediate individual feedback and group**

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3 discussions. To this stage excellent improvements have been demonstrated in
4 interventional specialties but not in primary care. However, in view of the confluence
5 of the principles of deliberate practice and deep learning approaches, we
6 recommend the evaluation of deliberate practice training models for trainees.
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11 We also draw attention to the ongoing difficulties in accessing GP or hospital records
12 from OOH settings; a situation which we acknowledge is unlikely to change without
13 the continued significant investment in NHS IT infrastructure.
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17 18 **Implications for future research**

19 We recognise that our study is a starting point for further research in this area. To
20 explore the generalisability of our findings to other OOH or alternative emergency
21 settings, our studies will need to be replicated with appropriate cohorts of GPs and
22 other clinicians working in such environments. We also propose to develop a
23 quantitative questionnaire based on our qualitative studies and on leads that we find
24 in the literature. Such studies, extending beyond our cohort, may then provide data
25 to allow greater generalisability of the results. We do not know if the practice
26 changes that we propose will lead to better clinical care and this needs separate
27 evaluation. Finally, investigation of the rules clinicians use for diagnostic closure may
28 give us insights into the root causes of clinical error. We are at this stage in the
29 process of developing a qualitative study, examining diagnostic error in general
30 practice.
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41 42 **Conclusions**

43 This study provides the first evidence of how working in an OOH environment
44 impacts on clinical reasoning and decision making. GPs identify OOH as a
45 potentially high risk clinical environment and adapt their practice approach to this
46 setting. Lack of access to GP or hospital records is a major concern. Our study
47 provides further support to the literature on reflective practice and educational
48 programs in clinical settings. We suggest that improving feedback to GPs about their
49 clinical decisions and providing opportunities for reflection on OOH practice may be
50 valuable for ongoing review and improvement of clinical practice. The findings
51 provide guidance to the development of GP training programs to cover the specific
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needs of OOH. Exploring further the rules and criteria that clinicians use for diagnostic closure may give us insights into the root causes of clinical error.

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Box 1a: Participants' perceptions of OOH environment (quotes in italics, numeric refers to interviewee ID). Emerging themes to question: *How is the OOH environment different from normal practice and how does it impact on your practice?* Frequently these comments came up spontaneously.

Theme	Example
Avoiding hospital referral	<i>avoid hospital .. indication [to refer only if] either further assessment is required or there is some definite intervention that the hospital can provide (11);</i> <i>intravenous fluids which of course can't be given in the GP context (13);</i>
Fire fighting	<i>only deal with the immediate situation that's sort [of] a bit of fire fighting (12);</i> <i>what can we do to make sure he's safe to be seen by his GP in the morning or do we need to admit him tonight (3);</i>
Time pressure	<i>not doing the other patients a service if they are sitting out there waiting (19);</i>
Practising in an unfamiliar environment	<i>easier to practise medicine in your own environment (5);</i>
High risk patients	<i>see a high proportion of high risk patient in out of hours...frightening sometimes (21);</i>

Box 1b: Impact of OOH environment on practice

Theme	Examples
Lack of background information & lack of clarity about agenda	<i>Challenging because you don't know the patients (9); whose agenda? (6); you don't have access to the records (16);</i>
Approach to patient	<i>I'm not quite so patient centred .. a bit of fire fighting ...don't want to miss critical things and if there's a red flag symptom that comes up ...[it] doesn't need to be acted upon (15);</i>
Lack of follow-up	<i>The sad thing about out of hours is that you don't follow up on most of your patients (18);</i>
Lack of feedback	<i>in reality as an out of hours presentation.. it is quite difficult to find out what the discharge diagnosis was (17);</i>
Attitude to work	<i>a rewarding part of my work... best provided by experienced general practitioners (11);</i>

Box 2. Key themes to differentiate between straightforward and demanding presentations. Question: *Can you explain why you felt that Case 1 was straightforward and second one more demanding or difficult?* (S: straightforward, D: demanding)

Theme	Example
Salient feature rapidly recognised or unclear	<p>S: <i>fine within about one minute of seeing the baby just by looking (3);</i></p> <p>D: <i>vague and there was sort of lack of symptoms a lack of I suppose a good history (4);</i></p>
Familiar or not	<p>S: <i>just the run of the mill you know straight forward diagnosis that you see commonly everyday (10);</i></p> <p>D: <i>uncomfortable because I had not seen a rash quite like that before(7);</i></p>
Age group	<p>S: <i>easy presentations occur in young people with no medical history and whom you don't have to worry at all about referring to old notes (15);</i></p> <p>D: <i>chronic ongoing problems where lots of doctors (16);</i></p>
Degree of ongoing uncertainty	<p>S: <i>it's about the degree of risk that I take .. it is about the degree of confidence that I have whether I can help them or not (14);</i></p> <p>D: <i>I had a degree of uncertainty about the second case that I didn't have about the first one (12);</i></p>
Severity of illness	<p>S: <i>Global impression that child is well [or the other] be dead in a few hours (1); If not serious, may or may not know the diagnosis but does not matter (6); you cannot make a definite diagnosis, no red flags (13);</i></p> <p>D: <i>more difficult I think the fact that there was a longer differential .. the stakes were higher ... I had a degree of uncertainty (12);</i></p>

Box 3: Process of reasoning in this context. Question: *Can you describe what was the main driver of the process?* Often these statements were made spontaneously during the interview. (Digit after stop refers to 1st or 2nd case for interviewee.)

Themes	Example
Clarify issues, and whose agenda to deal with first	<i>S: think firstly you have to identify what the real issue is (6.1); D: firstly, what real issue is, in OOH may be very problematic (1.2); too vague to formulate any thoughts (4.2);</i>
Looking for critical cues and red flags	<i>S: my main concern then was about her hydration (15.1); D: Especially fast resp rate without infection (1.2); wanted to establish that she was not confused (2.2);</i>
Process of ruling out serious illness first	<i>S: I sort of work backwards rather than forwards and so I want to rule out the serious things (16.2); I want to make sure they are systemically well (15.1); D: First thing was likely to be the usual just rule out anything serious (1.1);</i>
Process of ruling in common and safe condition	<i>S: rule in, since nil high risk (4.1); purpose was to confirm the diagnosis which she had given me looking for evidence to support .. hypothesis (12.1); D: initially I started with a net looking for the common causes (17.2); getting to the correct diagnosis and keeping her safe (20.2);</i>
Reassure patient and carers	<i>S: addressing the patient's concerns (15.1); D: my main concern was safety,.. how could I keep her as safe as possible while trying to respect her autonomy (10.2);</i>
Risk assessment	<i>S: [ketotic pregnant woman]: probably 90% certain that it was a urine infection, I would say 100% certain in this particular case that admission was needed (13.) ; I was just slightly concerned that he was starting something more serious so I said if his temperature went up persistently .. or if he became breathless ..he should contact back again and that there was somebody on the out of hours all weekend (14.1); D: err on the side of caution .. threshold to me feels like a fairly nebulous thing .. the clinical state of the patient was surprisingly good (5.2); I was reasonably confident .. there was this possibility that we would be able to [treat] her orally (11.2);</i>
Used another opinion	<i>well I actually got somebody else in to have a look at it (7.2); speaking to the medical registrar at the hospital .. the other</i>

	<i>deciding factor (10.2);</i>
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Box 4. Prerequisites for closure of diagnostic process. Question: *Can you try and explain what made you stop the process at this particular stage?*

Themes	Example
Perception of patient systemically well or unwell	Well: <i>I didn't think she was medically kind of unwell (4); vital signs were good (13);</i> Unwell: <i>She looked ill and she was vomiting profusely (19);</i>
Ruled out urgent or severe illness	<i>urgent problems .. excluded ..don't really know what's going on now, but I didn't think it was anything serious (3); I felt I'd done more excluding than I had done confirming (17);</i>
Ruled in non-urgent diagnosis with satisfactory confirmation	<i>know it's to be one of the simpler things but you have to ask the questions, and I guess how much is enough I mean at the point when I'm satisfied that there is significantly more confirmation of one of the simpler things than one of the nasties (5); the history and the examination coalesce on a simple diagnosis (11);</i>
Red flags present or absent	<i>ketotic .. don't think I could have done anything else (13); her gait was staggering (21);</i>
Set up good safety net	<i>safety netting because everyone makes mistakes, (1 9); I normally very scrupulous about safety netting because I'm paranoid about missing things (7); a gold star safety net in this case ...driver knew the patient (2);</i>
Responded to patient's needs	<i>.. in terms of the diagnosis I think I was less than 50% sure.. , but in terms of what was best to do for the patient ... towards 100% (18); I hadn't succeeded in allaying his anxieties (6); Stop since good explanation ie rule in and also consistent with parent expectations (7);</i>

Box 5: Trainee take home messages. Answers in response to question: *What sort of message would you like your trainee to take home from this consultation?*

Theme	Example

Patient related issues	<i>Take time to establish a rapport (2); listen to the patient's concerns (15);</i>
Case specific learning	<i>this is how chest infections present in the elderly (3); common things that can cause sudden deterioration in elderly patients (13); you know these kinds of vague symptoms in an elderly patient probably you would want to rule out anything sinister or acute (4); I'd want them to sort of look up investigations for unexplained bone pain and what would be the key questions for red flags and what blood tests they might want (9);</i>
The process	<i>looking at the global perspective of the child (1); I said to him look I really don't find signs of anything serious or anything potentially serious just now (6); the take home message is the safety net (5);</i>
Dealing with uncertainty	<i>uncertainty...sometimes you don't know .. talk them through the probability side of things I would discuss the things that lead me towards one way or another (7);</i>

Competing interests: No competing interests have been declared by the authors.

Contributorship statement:

John Balla designed the study, conducted the interviews, analysed the data, produced the first draft to final document.

Carl Heneghan and Matthew Thompson conceived the project and were involved with design and all stages of writing the drafts and final document.

Margaret Balla participated in the interviews and analysis as well as reviewing the drafts and final document.

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Appendix 1.

List of interview questions and their relevance to the theoretical model.

Introduction: *I would like to ask you to tell me about the presentation of two of your most recent cases seen in OOH; one straightforward and the other more difficult and not straightforward. Preferably start with the straightforward case.*

Purpose: to see what characteristic were perceived to make a case straightforward or difficult. How does this dichotomy relate to System 1 and 2. Difficult case should invoke System 2.

1. In response to presenting features: to note the timing of the first response and if aspects of the salient features can be recognised. Is this consistent with System 1?

Q1: *What was the first thing to pop into your head?*

Clarifying questions if required:

Q1.1: *As soon as you saw the patient or heard the presentation, what were the options that you were thinking of?*

Q1.2: *When did this happen?*

Q1.3: *Where do you think this came from?*

Frequently after any question throughout the interview:

Q1.4: Can you elaborate/explain?

2: Further exploration of the process: is there a framing effect as part of System 1.

Q2.1: *Can you tell me what you did then?*

Q2.2: *What was driving your questioning?*

Clarifying questions if required:

Q2.3: *And in particular did anything worry you? What was the main thing to rule out (or in)?*

3. Further exploration of the process: focus on a few critical cues or a deep search? Did they reflect on the validity of the cues used? Expect overlap of two systems.

Q3.1: *What were the critical cues/cardinal features you were looking for?*

Q3.2: *Did you find anything with a high predictive value?*

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4. Prerequisites for closure of diagnostic process: Are there any well defined rules or thresholds they were able to recognise? How much reflection was there?

Q4.1: *Can you try and explain what made you stop the process at this particular stage?*

Q4.2: *What did you consider when you decided the action to close (depending on the case discussed?)*

Q4.3: *Can you describe how comfortable you were with your decision? Can you give some sort of numerical figure for this, or other way of describing it?*

Q4.4: *Can you tell me how safety netting comes into this?*

5. Trainee take-home messages: may be basis of training program.

Q5: *What sort of message would you like your trainee to take home from this consultation?*

Last two questions at the end of the interview:

6. Differentiation between straightforward and demanding presentations: to provide indicators for use of System2.

Q6: *Can you explain why you felt that Case 1 was straightforward and Case 2 more demanding or difficult?*

7. Participants' perceptions of OOH environment: to provide indicators for increased practice risk. Frequently these comments came up spontaneously.

Q7: *How is the OOH environment different from normal practice and how does it impact on your practice?*



Clinical decision making in a high risk primary care environment: a qualitative study in the UK

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Manuscripts

COREQ guidelines table

Domain 1: Research team and reflexivity			Comment
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview?	JB and MB
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i>	FRCPE, MA
3.	Occupation	What was their occupation at the time of the study?	Research Fellows
4.	Gender	Was the researcher male or female?	1 male/1 female
5.	Experience and training	What experience or training did the researcher have?	>30 years qualitative research
Relationship with participants			Nil
6.	Relationship established	Was a relationship established prior to study commencement?	With some of them
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i>	Broad outlines given .
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i>	Reasons for research and interest in training
Domain 2: study design			
Theoretical framework			

COREQ guidelines table

9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>	Content analysis
Participant selection			
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i>	Convenience
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i>	Email and face-to-face
12.	Sample size	How many participants were in the study?	21
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	66% of those approached not interviewed for lack of time or interest
Setting			
14.	Setting of data collection	Where was the data collected? <i>e.g. home, clinic, workplace</i>	Clinic for most, 3 at home
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	No
16.	Description of sample	What are the important characteristics of the sample? <i>e.g. demographic data, date</i>	All experienced GPs in active clinical practice
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Pilot tested. Semi-structured interview
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No

COREQ guidelines table

19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	Audiotaped
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Yes
21.	Duration	What was the duration of the interviews or focus group?	30 minutes
22.	Data saturation	Was data saturation discussed?	Yes and reached about half way
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	2
25.	Description of the coding tree	Did authors provide a description of the coding tree?	yes
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Both, as we responded to the data
27.	Software	What software, if applicable, was used to manage the data?	Yes
28.	Participant checking	Did participants provide feedback on the findings?	yes
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i>	yes

COREQ guidelines table

30.	Data and findings consistent	Was there consistency between the data presented and the findings?	yes
31.	Clarity of major themes	Were major themes clearly presented in the findings?	yes
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	yes

Summary

Article focus

- Clinical reasoning and decision making in an out of hours primary care setting.
- The aim is to gain insights into how GPs make clinical decisions and manage risk in this environment.
- Implications for system changes and training

Key messages

- Clinical decision making in OOH is dominated by rule-out strategies for severe illness or potentially high risk diseases.
- GPs use three main criteria to determine diagnostic closure: global wellness with rule-outs, responded to patient needs, presence of a reliable safety net.
- Improvements to clinical decision making could be achieved by providing routine feedback to clinical staff working in OOH, building in systems to support reflection on clinical cases, and more tailored GP training.

Strengths and limitations of this study

- The design of the study is based on a strong theoretical framework provided by the dual theory of cognition.
- Face validity through using recently seen cases.
- Limitations relate primarily to sampling, participants consisting of self-selected individuals.

Abstract

Objective Examine clinical reasoning and decision making in an out of hours (OOH) primary care setting to gain insights into how general practitioners (GPs) make clinical decisions and manage risk in this environment.

Design: Semi-structured interviews using open-ended questions.

Setting A two-month qualitative interview study conducted in Oxfordshire, UK.

Participants 21 GPs working in OOH primary care.

Results The most powerful themes to emerge related to dealing with urgent potentially high risk cases, keeping patients safe and responding to their needs, whilst trying to keep patients out of hospital and the concept of 'fire fighting'. There

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3 were a number of well defined characteristics that GPs reported making
4 presentations easy or difficult to deal with. Severely ill patients were straightforward,
5 whilst the elderly, with complex multisystem diseases were often difficult. GPs
6 stopped collecting clinical information and came to clinical decisions when: high risk
7 disease and severe illness requiring hospital attention has been excluded; they had
8 responded directly to the patient's needs; and there was a reliable safety net in
9 place. Learning points that GPs identified as important for trainees in the OOH
10 setting included the importance of developing rapport in spite of time pressures;
11 learning to deal with uncertainty, and learning about common presentations with a
12 focus on critical cues to exclude severe illness.

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14 **Conclusions** Our findings support suggestions that improvements in primary care
15 OOH could be achieved by including automated and regular timely feedback system
16 for GPs, and individual peer and expert clinician support for GPs with regular
17 meetings to discuss recent cases. In addition, trainee support and mentoring to focus
18 on clinical skills, knowledge and risk management issues specific to OOH is currently
19 required. Investigating the stopping rules used for diagnostic closure may provide
20 new insights into the root causes of clinical error in such a high risk setting.
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32 Introduction

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34 Primary care in the UK is provided during weekends, evenings and overnight by
35 various types of out of hours (OOH) services, and it has become a core component
36 of round-the-clock primary care in many countries. Accessible and high quality OOH
37 services provide an important mechanism to reduce service pressures and
38 associated costs from inappropriate use of Emergency Department services.^[1] The
39 majority of OOH care in the UK is provided by general practitioners (GPs), often in
40 conjunction with emergency medical and nursing practitioners, and organised by
41 private providers or primary care trusts. Patients typically initiate contact through a
42 telephone triage system. Those requiring face to face consultations, but not urgent
43 hospital referral, are seen by a GP at a local clinic or in the patient's home.
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53 Patients who contact OOH services are more likely to have acute problems than
54 those who are seen in daytime primary care. Therefore, GPs working in OOH are
55 likely to meet a higher number of acutely ill patients than in their routine practice.
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3 Mostly these are 'new' patients, i.e. presenting to GPs who are unlikely to know them
4 and with little or no access to their GP or hospital records. The combination of lack of
5 continuity and high incidence of acute illness provides a potentially hazardous
6 practice environment, in which errors can occur. [2] Although the incidence of
7 significant clinical error is unknown, high profile adverse incidents have received
8 significant media attention, [3] and prompted a fundamental review of OOH service
9 provision in the UK. [4] Recommendations focussed on clinical governance, more
10 effective performance management, better team work and making patient records
11 more accessible. In addition they have highlighted staff development issues such as
12 the possible use of checklists, regular feedback, improving GP training for the
13 specific demands of OOH and individualised audits.
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23 However, the ways in which GPs make clinical decisions in OOH has received little
24 attention. Yet, how clinical decisions are made under these circumstances is
25 currently unknown, and little is known of the factors that affect safety and referral
26 patterns. We therefore examined clinical reasoning and decision making in an OOH
27 setting, with the aim of gaining insights into how GPs manage risk whilst keeping
28 patients safe in this environment and focussing on factors they may improve the
29 delivery of services.
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37 Methodology

38 Studies of clinical reasoning (CR) describe the reasoning processes employed
39 during a consultation. [5] We have previously published a model of CR based on our
40 work with GPs. [6] The assumption behind the model was that understanding the
41 reasoning process was essential for fruitful reflection on clinical practice. The model
42 highlights key areas of knowledge and critical value judgments that are used in the
43 clinical encounter. We used this model, which is derived from the dual theory of
44 cognition, [7] as the framework for a qualitative study of OOH practice. [8] We are not
45 aware of other studies that have tested the applicability of similar theory-based
46 models to real life consultations, though generic theoretical models have been
47 proposed. [9]
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56 The dual theory posits two systems interacting with each other. The non-analytic
57 System 1 provides the fast response, whilst the reflective System 2 is slow and may
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override the original response. There is rapid recognition of a salient feature of the case,^[10] which may stem from the context provided by what is already known about the patient, physical appearance or critical cues specific to a presentation. This links to pre-existing mental representations, based on theory and experience built up of multiple exposures to similar cases. Whilst some aspects of the salient feature can be described by the clinician, others may appear no more than a 'sense of alarm or reassurance', described as 'gut feelings' by Stolper et al,^[11] which impact on the reasoning and decision making process of GPs. This combination of recognition and gut feelings leads to a limited search for more cues. System 2 represents reasoning through the initial response vis-à-vis the rules provided by the theory of the profession and may lead to correcting or overriding System 1. In cases where there are no salient features perceived System 2 takes over in place of the absent fast response.^[7] The initial judgments provide the frame for the direction of the search for further information. Drivers prioritise the search, generally aimed at risk avoidance with the focus on ruling diagnostic options out or in, through searching for a few highly critical cues that support or negate the original frame. A necessary aspect of this kind of reasoning is a stopping rule for data collection, but we have not been able to find any research that describes them in a clinical setting.^[12]

Setting and cohort

We conducted a two month study in Oxfordshire, UK where OOH care is provided by a combination of different services. Most weekend, evening, and holiday care is provided by GPs employed by the primary care trust. Overnight services are provided by a private provider. Initially we invited all 62 GPs who regularly worked in the OOH service organised by the PCT. We asked them to participate in 30-minute interviews about two recently seen OOH cases. We chose 30 minutes to minimise the pressure on busy work schedules. From past experience, most GPs would be interviewed before or after consulting and often during their brief lunch breaks. The time allocated was deemed sufficient to capture the data on the issues on which we were focused. Information about the study was kept to a minimum to reduce respondent bias. We obtained positive responses from 29 (47%), and interviewed 21 (34%) GPs, who provided a total of 42 cases. Four GPs had been in practice < 5 years, nine for 5–20 years and eight for >20 years (range <1 year to 37 years). In our

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3 experience and in reports in the literature, busy professionals are relatively difficult to
4 persuade to find time for an interview. Therefore one is generally unlikely to find
5 random cohorts, the participants coming through word of mouth and professional
6 contacts. The only variable we would expect to have an impact for this study was
7 length of experience and in this respect our cohort was relatively well represented.
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12 **Design and data collection**

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14 To provide face validity to our findings we used recently seen cases; rather than
15 case vignettes in a laboratory setting. Participants were asked to describe the
16 presentation of two new patients who had consulted with them during their most
17 recent OOH session, and interviewed within 48 hours of their session. They were
18 asked to discuss a straightforward case and a more demanding one. After the first
19 few interviews it became apparent all straightforward cases offered were young
20 children with diarrhoea or raised temperature. Subsequent interviews excluded this
21 group of presentations. Most GPs referred to computer printouts of the cases during
22 the interviews. All interviews, conducted by a single researcher (JIB), were analysed,
23 audio-taped and transcribed. The GPs were asked to describe the presentation of
24 the patient and told that there would be interruptions to clarify what went on in their
25 mind during the consultation. The semi-structured interviews used open-ended
26 questions and focused on each step of the model.^[6] (Box 1)
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38 The literature suggests that the greatest impact on decision making occurs at the
39 first step which frames the direction of the process and at the final step of diagnostic
40 closure when immediate data collection stops and where most of the errors are likely
41 to occur.^{[13][14]} Our focus for the first step was to what extent GPs could describe the
42 salient feature that would lead to recognition of the case. We specifically did not
43 attempt to dig deeper or look for gut feelings, at the same time acknowledging their
44 prominence in the diagnostic process. On the other hand, we explored these
45 instinctive aspects at the stage of closure. This relates to our particular interest in
46 this step. The scope of the study would not allow us a full exploration of all facets of
47 each step.
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55 **Data analysis**

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3 The audiotapes were used to develop brief typed summaries of each case to gain a
4 sense of the processes; these were then used to build a structure for the analysis.
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6 This was carried out with NVivo software. Two researchers searched the text
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8 independently for underlying themes in relation to our conceptual framework.
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10 Categories were coded according to emerging themes and added to or changed as
11 new concepts emerged. ^[15] Any differences in interpretation were discussed and
12 consensus was reached on clustering to common themes.
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16 We divide the results into five areas: 1) the participants' perceptions of the OOH
17 environment and its impact on practice, 2) characteristics of a case to make it
18 straightforward or demanding; 3) the process of reasoning in this context; 4)
19 prerequisites for diagnostic closure, 5) learning points from OOH consultations for
20 GP trainees. Within each area we report on common themes raised by the
21 participants.
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27 28 **Results**

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30 All participants indicated that our questions were easy to understand and many
31 remarked that it was a good way for them to reflect on their practice. The analysis
32 was consistent with previous findings on the dual process of reasoning, where
33 instant recognition, followed by reasoning and value judgments lead to a search for a
34 limited number of cues prior to diagnostic closure. (Direct quotes from the interviews
35 appear in italics.)
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41 **1. Key perceptions of OOH environment and its impact on practice**

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43 The most powerful themes to emerge related to dealing with urgent potentially high
44 risk cases, trying to keep patients out of hospital, the concept of 'fire fighting', time
45 pressures and working in an unfamiliar environment (Box 1a). This challenging
46 environment impacted on their practice in a number of ways. It was often difficult to
47 work out whose agenda they had to deal with, the patient's or concerned relatives or
48 carers who had contacted the OOH service. Their approach to the patient was to
49 deal with immediate problems only, rather than the usual holistic approach, as
50 described by one GP: *basically you've got to decide whether this chap is safe*. Lack
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3 of feedback and follow-up was the rule: *you don't really tend to get any feedback at*
4 *all unless something has gone horrendously wrong* (Box 1b).
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8 **2. What makes a case straightforward or demanding?**

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10 There were a number of well-defined characteristics which made presentations easy
11 or difficult to deal with. The focus was very much on illness severity, and a severely
12 ill patient was seen as straightforward, as they just required hospital transfer: *It's*
13 *easy when somebody is terribly unwell....going to admit them to hospital.* Elderly
14 patients were often difficult because of the complex nature of multiple pre-existing
15 diseases in the absence of background information. Children and young adults were
16 seen as straightforward with well-defined single conditions: *Easy cases tend to be*
17 *younger people with less complicated medical histories and where serious things are*
18 *less common.* Familiarity with the condition helped, whilst falling between the two
19 extremes tended to lead to lack of confidence (Box 2).
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28 **3. The process of clinical reasoning**

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30 In most cases, there were instantaneous formulations, for instance, on seeing a two
31 year old child with two days of fever, runny nose, coughing and pulling her left ear:
32 *the likelihood is that it was probably a upper respiratory tract infection..with otitis*
33 *media.* The salient features that brought these to mind were generally recognised:
34 *had all the signs of a grizzly toddler tugging at the left ear, yep have to exclude an*
35 *otitis media.* An inability to make such instantaneous judgment made the case
36 difficult and required data clarification which was not always achieved. Once
37 presentation issues were clarified, early formulations were associated with brief lists,
38 generally headed by the most high risk clinical conditions. This drove the search for
39 one or two critical cues to rule out these. There was a particular focus on red flags
40 which potentially indicated severe illness: *she's quite dry....her oxygen saturation is a*
41 *little bit low.. I'm really thinking about, is this lady compromised because of her*
42 *diarrhoea?* (Box 3).
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54 **4. Prerequisites for diagnostic closure**

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56 Diagnostic closure occurs when the clinician stops immediate data collection and
57 makes a management decision based on the available information. A rule of thumb
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3 used by one GP defined the issue: *dividing people into two groups....on the basis of*
4 *one question: is it serious or potentially serious or not?* Confidence to stop and
5 make a decision was then assessed using a number of criteria as in Box 4.
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10 Confidence that appropriate threshold had been reached was rarely stated
11 numerically by participants, and when asked to assess this way it was generally over
12 90%, but some were not willing to go beyond a descriptive assessment. As a
13 prerequisite to closure, GPs depended on a combination of three criteria being met:
14 1) Confidence in ruling out a list of diseases, with clarity about illness severity: *I'd*
15 *reached the end of what I could do.* 2) Meeting patient's needs: *I'd relieved the*
16 *patient's anxiety that was the main issue at stake.* 3) An ability to set up a good
17 safety net: *a gold star safety net in this case.* This is described as particularly
18 important in emergency settings where diagnostic uncertainty is prominent and the
19 patient's condition may deteriorate unexpectedly.^[16] It was consistently stressed
20 during our interviews: *mum was,...supportive,...safety netting was pretty major,* and as
21 a consequence, GPs went to great lengths to set one up if necessary.
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31 **5. Learning points for GP trainees**

32 This was the last question we asked about each case. It turned out to be particularly
33 useful as it gave GPs time to pause and reflect on what they regarded as particularly
34 significant training issues relating to that consultation. Emerging themes divided into
35 1) training needs on how to deal with patients, stressing the need to develop rapport
36 despite the intense time pressures; 2) learning to deal with uncertainty: *think about*
37 *how certain am I, how certain do I need to be to send him home;* and 3) learning
38 about common presentations with a focus on critical cues to exclude severe illness
39 and a few high risk diseases: *what are the danger signs you would look out for;*
40 *specific symptom questions you want to ask* (Box 5).
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49 **Discussion**

50 To our knowledge this is the first study to show how the context of OOH practice
51 impacts on the clinical reasoning process in primary care. Participants were aware
52 their behaviours and decisions were affected by the environment. In line with the
53 perceived purpose of OOH care, objectives were to keep patients safe, respond to
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3 their needs, and reduce unnecessary hospital attendances. Their expectation was to
4 deal with urgent and potentially high risk issues only, avoiding hospital admissions
5 unless patients were at unacceptable risk.
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10 GPs found practice in OOH rewarding, but identified a number of issues which made
11 this a high risk clinical environment. The most prominent of these include a lack of
12 background information in the form of medical records, and complex multisystem
13 chronic disease presentations where it was difficult to define the pertinent issues.
14 Success depended on clinical skills to develop rapport with patients and recognise
15 their concerns. Lack of regular feedback on clinical performance was raised
16 repeatedly.
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23 **Our findings were consistent with the dual theory of cognition. In line with System 1,**
24 **there was instant recognition on finding salient features of the presentation.** Even
25 before GPs knew the presenting complaint, they were constantly on the lookout for
26 severe illness (Boxes 1a and 2), using red flags (Box 3), and well-trying markers of
27 systemic illness (Box 4). Lists and markers were derived from personal experience
28 and the novice would struggle in their absence (Box 5). **These early cues would**
29 **frame the immediate search for further cues.** The major driver was to exclude
30 serious disease and severe illness (Box 3). Ruling out is commonly used in everyday
31 practice^[17] but it was practically uniform in OOH. It was surprising how often this
32 was seen as 'working backwards rather than forwards'. **System 2 which represents**
33 **correcting or overriding System1 was used in many but not all cases.** For instance,
34 ruling in first was used only occasionally, in straightforward familiar presentations
35 and then followed by ruling out in most cases. Once serious disease, severe illness
36 or the risk of abrupt deterioration were excluded, the precise diagnosis became less
37 important and could be left for another day. **Such decisions, as they often required**
38 **reflection, represented System 2.** Diagnostic closure which occurs after a clinician
39 has weighed up all the options and needs to choose a specific course of action, in all
40 but the most clear-cut presentation would involve such reflection (Box 4). This is the
41 point where clinical errors crystallise and therefore understanding the rules and
42 thresholds for stopping, provides insights into the causes of diagnostic error. Little is
43 known about how diagnostic closure occurs in most clinical specialties and settings,
44 including primary care. The OOH setting provided a unique opportunity to gain
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3 insights into diagnostic closure, as clinical care is associated with clear-cut
4 endpoints, not often seen in other practice settings. The stopping rules used by GPs
5 involved three criteria: firstly, have high risk conditions and severe illness that require
6 urgent hospital attention been excluded? Secondly, have I responded directly to the
7 patient's needs? Thirdly, is there a reliable safety net in place, given the high risk
8 environment where error may be more likely than in a familiar situation?
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15 The basis of individualised judgments about acceptable confidence levels for the
16 stopping rules were difficult to define and as one GP put it '*feels like a nebulous*
17 *thing*'. This is consistent with a previous study, which used an end point of variation
18 in hospital referral rates and concluded that the individual nature of learning from
19 experience leads to a variation in approach to risk tolerance and associated
20 confidence levels for decision making.^[18] We believe that our findings are consistent
21 with the work of Gabbay and le May,^[19] who suggested that multiple exposures to
22 clinical experience, embedded in a social context lead to a set of 'internalised,
23 collectively reinforced and often tacit guidelines...malleable to deal both with
24 individual patients' needs and the multifarious factors that come into reckoning when
25 making decisions.'
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35 **Strengths and limitations of the study**

36 This is the first study that we are aware of that has explicitly explored the diagnostic
37 reasoning that occurs in OOH primary care, and is likely to be relevant to other
38 countries with similar systems of primary care. The design of the study is based on a
39 strong theoretical framework provided by the dual theory of cognition. This has been
40 shown to have generalisability to human reasoning irrespective of the domain.^[7]
41 There are also good theoretical models suggesting that clinical thinking can be
42 modelled within this framework.^[9] The study also has face validity using recently
43 seen cases, where participants were not made aware of the content and purpose of
44 the interviews.
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51 Limitations relate to a number of issues. 1) **Sampling:** Participants were not chosen
52 at random, but consisted of self-selected individuals who made up a third of a cohort
53 we approached. This is an almost universal problem with studies that involve busy
54 and senior clinicians. We asked participants to select the two most recently seen
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3 patients who met the selection criteria. We cannot be certain if these rules were
4 always applied. We have not performed similar patient based studies in other
5 settings in the UK or in countries with different health systems and to this stage the
6 research has not included other specialty groups. 2) There are concerns regarding
7 the validity of think aloud protocols, but they have been considered appropriate for
8 studies of cognition in natural settings as used here. [20] 3) We designed the study to
9 allow us to focus on specified steps of the clinical reasoning process, e.g. closure.
10 This means that some steps could not have full coverage of issues, such as some of
11 the crucial intuitive aspects of the early stages of diagnosis. This will require further
12 qualitative work. 4) Another issue relates to triangulation. These qualitative studies
13 lead to the development of inventories suitable for triangulation through quantitative
14 studies.
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16 We believe that the dual theory of cognition is the closest model to how people
17 actually think in real life scenarios and this makes it an appropriate way to study
18 reasoning in a clinical setting. [13] On account of the strong theoretical base, our
19 findings, albeit with different emphases, are likely to have some degree of
20 generalisability to other specialties and health systems.
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23 **Implications for practice**

24 High quality OOH care is important to the functioning of the health service, and
25 particularly the interface between primary care, emergency care and acute hospital
26 care. While the results of our investigation provide a unique insight into the clinical
27 decision making that occurs in OOH, we have several practical recommendations
28 based on our research which could potentially be implemented with minimal
29 additional resources.
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32 Recognising the limitations of our study, we also find that our conclusions are
33 consistent with the literature on the importance of feedback on performance and
34 settings for fruitful reflection on experience. We believe that given this congruence
35 between the relevant literature and our proposals, our recommendations merit
36 cautious acceptance and evaluation.
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39 Firstly, at the organisational level an automated, regular and timely system of
40 feedback to GPs and other clinical staff practising in the OOH setting is essential.
41 Providing clinical care in an environment almost devoid of clinical feedback (apart
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3 from when there are complaints or serious events) is contrary to the type of practice
4 that GPs are trained to work in. One of the mainstays of primary care practice is the
5 longitudinal relationship with patients, so that information gathering and clinical
6 decision making occur over several encounters. In the OOH setting, this process
7 becomes compressed, and is compounded by high patient flow. Since the vast
8 majority of OOH care is provided by local GPs and other staff, an initial step would
9 be to provide routine feedback on the outcomes of their clinical decisions. Since
10 most OOH services are now computerised, this could be implemented with little
11 additional resource. **These systems need to be implemented with sensitivity,**
12 **recognising the risk of creating anxiety and dislike of being monitored. Feedback**
13 **needs to be seen as non-judgmental and to be used by the recipient and trusted**
14 **colleagues only. The importance of regular feedback on performance to gain**
15 **expertise is well accepted in the literature.** [21]

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25 Secondly, for the individual, in line with the principles of fruitful learning from
26 experience, we suggest that peer and expert clinician support with regular meetings
27 and feedback on recent cases should be implemented. **The educational literature**
28 **provides good evidence that practice with feedback enhances deep learning which**
29 **goes with improved understanding of subject matter.** [22] GPs would then be in a
30 position to reflect, calibrate their decision making and update their mental constructs,
31 all necessary for good practice. Some GPs noted that they previously had used
32 informal coffee breaks to do this, but the increasing numbers of patients attending
33 OOH now precluded this. However, such informal systems are probably inadequate,
34 and **we propose that OOH practice should experiment with formal opportunities for**
35 **reflection in a safe and supportive environment.**

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45 Thirdly, our research has implications for training GPs, whose requirement for OOH
46 training and experience is fairly modest. Individual mentoring and group discussions
47 need to focus on 1) how to develop rapport with new and anxious patients; 2) how to
48 deal with uncertainty; and 3) common presentations with a focus on critical cues to
49 exclude severe illness and the relatively few high risk diseases. **We believe that the**
50 **model of deliberate practice as described by Ericsson,** [23] **is likely to be a suitable**
51 **model for training. .The clinician seeks out cases in areas of perceived weakness**
52 **and practice is associated with immediate individual feedback and group**

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3 discussions. To this stage excellent improvements have been demonstrated in
4 interventional specialties but not in primary care. However, in view of the confluence
5 of the principles of deliberate practice and deep learning approaches, we
6 recommend the evaluation of deliberate practice training models for trainees.
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11 We also draw attention to the ongoing difficulties in accessing GP or hospital records
12 from OOH settings; a situation which we acknowledge is unlikely to change without
13 the continued significant investment in NHS IT infrastructure.
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17 18 **Implications for future research**

19 We recognise that our study is a starting point for further research in this area. To
20 explore the generalisability of our findings to other OOH or alternative emergency
21 settings, our studies will need to be replicated with appropriate cohorts of GPs and
22 other clinicians working in such environments. We also propose to develop a
23 quantitative questionnaire based on our qualitative studies and on leads that we find
24 in the literature. Such studies, extending beyond our cohort, may then provide data
25 to allow greater generalisability of the results. We do not know if the practice
26 changes that we propose will lead to better clinical care and this needs separate
27 evaluation. Finally, investigation of the rules clinicians use for diagnostic closure may
28 give us insights into the root causes of clinical error. We are at this stage in the
29 process of developing a qualitative study, examining diagnostic error in general
30 practice.
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41 42 **Conclusions**

43 This study provides the first evidence of how working in an OOH environment
44 impacts on clinical reasoning and decision making. GPs identify OOH as a
45 potentially high risk clinical environment and adapt their practice approach to this
46 setting. Lack of access to GP or hospital records is a major concern. Our study
47 provides further support to the literature on reflective practice and educational
48 programs in clinical settings. We suggest that improving feedback to GPs about their
49 clinical decisions and providing opportunities for reflection on OOH practice may be
50 valuable for ongoing review and improvement of clinical practice. The findings
51 provide guidance to the development of GP training programs to cover the specific
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3 needs of OOH. Exploring further the rules and criteria that clinicians use for
4 diagnostic closure may give us insights into the root causes of clinical error.
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Box 1a: Participants' perceptions of OOH environment (quotes in italics, numeric refers to interviewee ID). Emerging themes to question: *How is the OOH environment different from normal practice and how does it impact on your practice?* Frequently these comments came up spontaneously.

Theme	Example
Avoiding hospital referral	<i>avoid hospital .. indication [to refer only if] either further assessment is required or there is some definite intervention that the hospital can provide (11); intravenous fluids which of course can't be given in the GP context (13);</i>
Fire fighting	<i>only deal with the immediate situation that's sort [of] a bit of fire fighting (12); what can we do to make sure he's safe to be seen by his GP in the morning or do we need to admit him tonight (3);</i>
Time pressure	<i>not doing the other patients a service if they are sitting out there waiting (19);</i>
Practising in an unfamiliar environment	<i>easier to practise medicine in your own environment (5);</i>
High risk patients	<i>see a high proportion of high risk patient in out of hours...frightening sometimes (21);</i>

Box 1b: Impact of OOH environment on practice

Theme	Examples
Lack of background information & lack of clarity about agenda	<i>Challenging because you don't know the patients (9); whose agenda? (6); you don't have access to the records (16);</i>
Approach to patient	<i>I'm not quite so patient centred .. a bit of fire fighting ...don't want to miss critical things and if there's a red flag symptom that comes up ...[it] doesn't need to be acted upon (15);</i>
Lack of follow-up	<i>The sad thing about out of hours is that you don't follow up on most of your patients (18);</i>
Lack of feedback	<i>in reality as an out of hours presentation.. it is quite difficult to find out what the discharge diagnosis was (17);</i>
Attitude to work	<i>a rewarding part of my work... best provided by experienced general practitioners (11);</i>

Box 2. Key themes to differentiate between straightforward and demanding presentations. Question: *Can you explain why you felt that Case 1 was straightforward and second one more demanding or difficult?* (S: straightforward, D: demanding)

Theme	Example
Salient feature rapidly recognised or unclear	<p>S: <i>fine within about one minute of seeing the baby just by looking (3);</i></p> <p>D: <i>vague and there was sort of lack of symptoms a lack of I suppose a good history (4);</i></p>
Familiar or not	<p>S: <i>just the run of the mill you know straight forward diagnosis that you see commonly everyday (10);</i></p> <p>D: <i>uncomfortable because I had not seen a rash quite like that before(7);</i></p>
Age group	<p>S: <i>easy presentations occur in young people with no medical history and whom you don't have to worry at all about referring to old notes (15);.</i></p> <p>D: <i>chronic ongoing problems where lots of doctors (16);</i></p>
Degree of ongoing uncertainty	<p>S: <i>it's about the degree of risk that I take .. it is about the degree of confidence that I have whether I can help them or not (14);</i></p> <p>D: <i>I had a degree of uncertainty about the second case that I didn't have about the first one (12);</i></p>
Severity of illness	<p>S: <i>Global impression that child is well [or the other] be dead in a few hours (1); If not serious, may or may not know the diagnosis but does not matter (6); you cannot make a definite diagnosis, no red flags (13);</i></p> <p>D: <i>more difficult I think the fact that there was a longer differential .. the stakes were higher ... I had a degree of uncertainty (12);</i></p>

Box 3: Process of reasoning in this context. Question: *Can you describe what was the main driver of the process?* Often these statements were made spontaneously during the interview. (Digit after stop refers to 1st or 2nd case for interviewee.)

Themes	Example
Clarify issues, and whose agenda to deal with first	<i>S: think firstly you have to identify what the real issue is (6.1); D: firstly, what real issue is, in OOH may be very problematic (1.2); too vague to formulate any thoughts (4.2);</i>
Looking for critical cues and red flags	<i>S: my main concern then was about her hydration (15.1); D: Especially fast resp rate without infection (1.2); wanted to establish that she was not confused (2.2);</i>
Process of ruling out serious illness first	<i>S: I sort of work backwards rather than forwards and so I want to rule out the serious things (16.2); I want to make sure they are systemically well (15.1); D: First thing was likely to be the usual just rule out anything serious (1.1);</i>
Process of ruling in common and safe condition	<i>S: rule in, since nil high risk (4.1); purpose was to confirm the diagnosis which she had given me looking for evidence to support .. hypothesis (12.1); D: initially I started with a net looking for the common causes (17.2); getting to the correct diagnosis and keeping her safe (20.2);</i>
Reassure patient and carers	<i>S: addressing the patient's concerns (15.1); D: my main concern was safety,.. how could I keep her as safe as possible while trying to respect her autonomy (10.2);</i>
Risk assessment	<i>S: [ketotic pregnant woman]: probably 90% certain that it was a urine infection, I would say 100% certain in this particular case that admission was needed (13.); I was just slightly concerned that he was starting something more serious so I said if his temperature went up persistently .. or if he became breathless ..he should contact back again and that there was somebody on the out of hours all weekend (14.1); D: err on the side of caution .. threshold to me feels like a fairly nebulous thing .. the clinical state of the patient was surprisingly good (5.2); I was reasonably confident .. there was this possibility that we would be able to [treat] her orally (11.2);</i>
Used another opinion	<i>well I actually got somebody else in to have a look at it (7.2); speaking to the medical registrar at the hospital .. the other</i>

	<i>deciding factor (10.2);</i>
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Box 4. Prerequisites for closure of diagnostic process. Question: *Can you try and explain what made you stop the process at this particular stage?*

Themes	Example
Perception of patient systemically well or unwell	Well: <i>I didn't think she was medically kind of unwell (4); vital signs were good (13);</i> Unwell: <i>She looked ill and she was vomiting profusely (19);</i>
Ruled out urgent or severe illness	<i>urgent problems .. excluded ..don't really know what's going on now, but I didn't think it was anything serious (3); I felt I'd done more excluding than I had done confirming (17);</i>
Ruled in non-urgent diagnosis with satisfactory confirmation	<i>know it's to be one of the simpler things but you have to ask the questions, and I guess how much is enough I mean at the point when I'm satisfied that there is significantly more confirmation of one of the simpler things than one of the nasties (5); the history and the examination coalesce on a simple diagnosis (11);</i>
Red flags present or absent	<i>ketotic .. don't think I could have done anything else (13); her gait was staggering (21);</i>
Set up good safety net	<i>safety netting because everyone makes mistakes, (1 9); I normally very scrupulous about safety netting because I'm paranoid about missing things (7); a gold star safety net in this case ...driver knew the patient (2);</i>
Responded to patient's needs	<i>.. in terms of the diagnosis I think I was less than 50% sure.. , but in terms of what was best to do for the patient ... towards 100% (18); I hadn't succeeded in allaying his anxieties (6); Stop since good explanation ie rule in and also consistent with parent expectations (7);</i>

Box 5: Trainee take home messages. Answers in response to question: *What sort of message would you like your trainee to take home from this consultation?*

Theme	Example

Patient related issues	<i>Take time to establish a rapport (2); listen to the patient's concerns (15);</i>
Case specific learning	<i>this is how chest infections present in the elderly (3); common things that can cause sudden deterioration in elderly patients (13); you know these kinds of vague symptoms in an elderly patient probably you would want to rule out anything sinister or acute (4); I'd want them to sort of look up investigations for unexplained bone pain and what would be the key questions for red flags and what blood tests they might want (9);</i>
The process	<i>looking at the global perspective of the child (1); I said to him look I really don't find signs of anything serious or anything potentially serious just now (6); the take home message is the safety net (5);</i>
Dealing with uncertainty	<i>uncertainty...sometimes you don't know .. talk them through the probability side of things I would discuss the things that lead me towards one way or another (7);</i>

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Contributorship statement :

John Balla designed the study, conducted the interviews, analysed the data, produced the first draft to final document.

Carl Heneghan and Matthew Thompson conceived the project and were involved with design and all stages of writing the drafts and final document.

Margaret Balla participated in the interviews and analysis as well as reviewing the drafts and final document.

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Appendix 1.

List of interview questions and their relevance to the theoretical model.

Introduction: *I would like to ask you to tell me about the presentation of two of your most recent cases seen in OOH; one straightforward and the other more difficult and not straightforward. Preferably start with the straightforward case.*

Purpose: to see what characteristic were perceived to make a case straightforward or difficult. How does this dichotomy relate to System 1 and 2. Difficult case should invoke System 2.

1. In response to presenting features: to note the timing of the first response and if aspects of the salient features can be recognised. Is this consistent with System 1?

Q1: *What was the first thing to pop into your head?*

Clarifying questions if required:

Q1.1: *As soon as you saw the patient or heard the presentation, what were the options that you were thinking of?*

Q1.2: *When did this happen?*

Q1.3: *Where do you think this came from?*

Frequently after any question throughout the interview:

Q1.4: Can you elaborate/explain?

2: Further exploration of the process: is there a framing effect as part of System 1.

Q2.1: *Can you tell me what you did then?*

Q2.2: *What was driving your questioning?*

Clarifying questions if required:

Q2.3: *And in particular did anything worry you? What was the main thing to rule out (or in)?*

3. Further exploration of the process: focus on a few critical cues or a deep search? Did they reflect on the validity of the cues used? Expect overlap of two systems.

Q3.1: *What were the critical cues/cardinal features you were looking for?*

Q3.2: *Did you find anything with a high predictive value?*

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4. Prerequisites for closure of diagnostic process: Are there any well defined rules or thresholds they were able to recognise? How much reflection was there?

Q4.1: *Can you try and explain what made you stop the process at this particular stage?*

Q4.2: *What did you consider when you decided the action to close (depending on the case discussed?)*

Q4.3: *Can you describe how comfortable you were with your decision? Can you give some sort of numerical figure for this, or other way of describing it?*

Q4.4: *Can you tell me how safety netting comes into this?*

5. Trainee take-home messages: may be basis of training program.

Q5: *What sort of message would you like your trainee to take home from this consultation?*

Last two questions at the end of the interview:

6. Differentiation between straightforward and demanding presentations: to provide indicators for use of System2.

Q6: *Can you explain why you felt that Case 1 was straightforward and Case 2 more demanding or difficult?*

7. Participants' perceptions of OOH environment: to provide indicators for increased practice risk. Frequently these comments came up spontaneously.

Q7: *How is the OOH environment different from normal practice and how does it impact on your practice?*