

Missed opportunities for diagnosis:

lessons learned from diagnostic errors in primary care

Abstract

Background

Because of the difficulties inherent in diagnosis in primary care, it is inevitable that diagnostic errors will occur. However, despite the important consequences associated with diagnostic errors and their estimated high prevalence, teaching and research on diagnostic error is a neglected area.

Aim

To ascertain the key learning points from GPs' experiences of diagnostic errors and approaches to clinical decision making associated with these.

Design and setting

Secondary analysis of 36 qualitative interviews with GPs in Oxfordshire, UK.

Method

Two datasets of semi-structured interviews were combined. Questions focused on GPs' experiences of diagnosis and diagnostic errors (or near misses) in routine primary care and out of hours. Interviews were audiorecorded, transcribed verbatim, and analysed thematically.

Results

Learning points include GPs' reliance on 'pattern recognition' and the failure of this strategy to identify atypical presentations; the importance of considering all potentially serious conditions using a 'restricted rule out' approach; and identifying and acting on a sense of unease. Strategies to help manage uncertainty in primary care were also discussed.

Conclusion

Learning from previous examples of diagnostic errors is essential if these events are to be reduced in the future and this should be incorporated into GP training. At a practice level, learning points from experiences of diagnostic errors should be discussed more frequently; and more should be done to integrate these lessons nationally to understand and characterise diagnostic errors.

Keywords

clinical reasoning; decision making; diagnosis; diagnostic errors; education; general practice.

INTRODUCTION

*'To learn only from one's own mistakes would be a slow and painful process and unnecessarily costly to one's patients. Experiences need to be pooled so that doctors may also learn from the errors of others.'*¹

Accurate and timely diagnosis is central to a GP's role, and represents one of the most challenging aspects of primary care. Diagnostic error is increasingly recognised as a research priority,² and has been described as the next frontier for patient safety. Although research into diagnostic error in primary care is limited, diagnostic errors are known to occur frequently,^{3,4} and causes are broadly categorised into system, patient, and doctor factors. Doctor factors are further divided into knowledge deficits and cognitive errors due to mistakes in clinical reasoning.

The dual theory of cognition⁵ proposes that the cognitive processes involved in decision making involve two interacting systems: system 1 (fast, automatic, and effortless); and system 2 (slower and analytical). Two qualitative studies used this model as a theoretical framework for analysis when exploring strategies for diagnostic closure and diagnostic error.^{6,7} Given the importance of diagnostic errors in primary care, a secondary analysis of these datasets was performed.^{6,7} By combining

the datasets, comparisons between cases in which errors occurred or were nearly missed, and those thought to be free of error, were possible. Moreover, the aim was to look more generally at approaches to decision making, highlight key learning points from GPs' experiences of diagnosis and error, and consider the implications of these for GP training. Modified grounded theory analysis was used to maximise the potential learning points from this rich dataset.

METHOD

A secondary analysis of 36 semi-structured interviews was conducted using two existing datasets^{6,7} (interviews originally conducted between 2010 and 2011). In the first dataset,⁶ GPs described the presentation of two new patients who had consulted with them during their most recent out-of-hours (OOH) shift: one challenging case and one straightforward case. In the second dataset, GPs discussed experiences of diagnostic errors from their clinical practice: these included 45 cases of either diagnostic errors or near misses.⁷

Participants' demographic details are summarised in Table 1. In each study, sample size was determined by the number of participants required to reach data saturation. A setting convenient to participants was selected, most commonly, their consulting rooms. Interviews were

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How this fits in

Previous research has demonstrated that diagnostic errors are common and can have important implications for patient safety. Research on clinical reasoning has characterised strategies used in GP consultations, described cognitive biases associated with errors, and focused on the dual theory of cognition. This secondary analysis combines 36 qualitative interviews with GPs in both routine and out-of-hours settings to allow comparisons to be made between cases thought to be free of diagnostic error and cases in which errors occurred or were narrowly missed. It focuses on the approaches to clinical decision making that are implicated in diagnostic errors. Learning points from GPs' experiences of these cases and the implications of these for training are discussed.

audiorecorded, transcribed verbatim, and anonymised prior to the secondary analysis.

Combining these datasets allowed useful comparisons to be made between cases thought to be free of diagnostic error, and cases in which errors occurred or were narrowly avoided. It also facilitated comparisons between decision making in routine general practice and OOH. All participants were asked specifically to reflect on learning points from the cases discussed.

Data analysis

For this secondary analysis, data were analysed thematically employing a modified grounded theory approach (compared to the structured, theoretically driven primary analysis). The primary analyst developed a coding scheme based on the content of

the transcripts, and grouped codes into themes. A selection of transcripts were independently coded, which confirmed and expanded the coding scheme. Quality and rigour were further improved by discussing the coding scheme and emerging themes among all authors. Once agreement was reached, the interviews were coded accordingly and facilitated by NVivo 10 (version 10).

RESULTS

Several important learning points were identified, these included GPs' reliance on pattern recognition, the 'restricted rule out' approach, acting on a sense of unease, and strategies for managing uncertainty in primary care. Findings are discussed in detail below.

Pattern recognition

A key aspect of clinical reasoning that emerged strongly was pattern recognition. GPs described how they '*think in patterns rather than in diagnoses*' (G10), particularly for common conditions such as urinary tract infection.

Errors resulted when atypical presentations meant that symptoms did not fit a known and recognisable pattern. For example, one GP described missing an opportunity to diagnose an abdominal aortic aneurysm:

'... this atypical leg pain ... couldn't work out what was going on ... I spoke to him OOH because he had this atypical sciatica ... and he came back I think and saw me one more time and he subsequently collapsed at home and died.' (G7)

Reflecting on this case, the GP suggested that:

'You know I've seen an awful lot of illness and consult an awful lot so if something doesn't fit ... it should ring alarm bells ... I think that anything that is atypical you have to worry if it doesn't fit into a recognisable pattern and the more experienced you get, you know, the broader your rapture of recognisable patterns become.' (G7)

A difficulty here for trainees is that pattern recognition relies on experience. One suggestion for developing this approach was:

'... the only thing I'd say is if you see something that's really odd, go and ask somebody else what they think about it.' (G10)

Table 1. Demographic details of study participants

Variable	n	%
Sex		
Female	12	33
Male	24	67
Years since qualification		
≤10	9	25
11–20	10	28
21–30	9	25
31–40	7	19
Data not collected	1	3

Pattern recognition also failed when GPs encountered a discord between their own 'mental model' of a condition and the reality of the patient presentation, which sometimes contributed to diagnostic error.

Restricted rule out

The importance of considering all potentially serious conditions was a prevailing theme and the strategy of 'ruling out the worst case scenario' was associated with avoiding some diagnostic errors, particularly in the OOH setting.⁶ Indeed, some GPs felt that this was even more important than making the correct diagnosis. Yet this approach may be counter-intuitive to the trainee:

'You seem to be happy about making a diagnosis, that's the achievement, almost, you know, so when you are very junior you want to make a diagnosis.' (G1)

Another difficulty arose when the seriousness or acuity of the presentation was misjudged, or there was confusion about what could safely be ruled out accurately in primary care:

'... we have a trainee ... he saw a patient who came in with chest pain ... He'd written "chest pain for the last 3 or 4 days ... dull ache in centre of chest". I think she was a smoker and she was about ... 50, and he said "probably not acute ... arrange outpatient exercise test ...". Clearly, he's missed the fact that ... one can't rule out an acute MI [myocardial infarction] so we sent her in by ambulance.' (G3)

In an effort to rule out the worst case scenario, GPs frequently described searching for the presence or absence of certain key features ('red flags'). In many cases, GPs described how this was helpful; however, situations were identified where GPs failed to realise that a presenting symptom was a red flag. In the case below this led to a missed opportunity to diagnose a subarachnoid haemorrhage:

'Woman probably in her 40s who'd had a headache for about 24 hours which just wasn't getting any better ... I didn't think that there was any cause for alarm ... just safety netted and told her that if things get worse, if you start vomiting you know you must call someone again and in fact only about an hour or two later ... she saw a ... colleague of mine who admitted the patient with a query subarachnoid and that's what she had ... I mean in hindsight now ... new-onset quite severe headache

in a 40-something-year-old is a red flag in itself.' (G7)

It was also highlighted that the use of red flags to exclude serious pathology is limited to only certain conditions:

'I think red flags are fine for particular conditions, so you know, if you have backache and red flags, if you have a change of bowel habit and red flags ... but I don't know how useful they are for vague presentations ... you need to be very careful.' (G7)

Occasionally, GPs relied on certain tests to rule out serious diagnoses, but later realised that this was inappropriate:

'I was relying on her haemoglobin being normal to almost rule out bowel cancer.' (G2)

Thus the important message was to know *'... if something really is a rule out or not'* (G2), which requires knowledge about evidence for the diagnostic accuracy of tests available in primary care.

Sense of unease

GPs frequently talked about situations in which they had felt there was something seriously wrong with a patient but were unable to explain this logically. They felt these feelings were learned through experience, unlike other strategies that were more knowledge-based.

It was indicated that some errors could perhaps have been avoided if GPs had paid attention to their sense of unease. One GP who described the case of a delayed diagnosis of a strangulated hernia recalled:

'Sometimes you get a little alarm ringing in your head and you don't, I mean now I always listen to it, but sometimes you think is that genuinely a concern or is it not, and at the time I remember thinking maybe, maybe I should be doing something else but it was a very faint kind of thing.' (G13)

It was also recognised that paying attention to the concerns of parents or carers could help prevent diagnostic error, as described by a GP who saw a child in OOH:

'They came into base and he did have tonsillitis but he was on the correct treatment which was penicillin ... and I said to the parents "well, he's on the right

treatment. We probably just need to give it a bit longer" but the parents were quite insistent that, you know ... that I started to explore in my head "well, have I really ruled out everything?" Then I thought fever for 5 days, could this be Kawasaki? ... there were enough boxes that one could tick that it might fit ... and ... it was Kawasaki [disease].' (G8)

Prompted by parental concern, this GP changed their approach and applied more analytical reasoning, which meant that a diagnostic error was avoided. Participants stressed the importance of GPs not ignoring their sense of unease, rather, acting on it even if that meant changing their mind during or after a consultation.

Managing uncertainty

The inevitability of uncertainty as a GP emerged as a strong theme. Participants discussed the need to accept uncertainty, but also acknowledged how difficult this can be. GPs suggested strategies to reduce uncertainty, which may also help to prevent diagnostic errors from occurring.

One of the most important learning points was to encourage GPs to discuss cases with colleagues in either primary or secondary care:

'If you are uncertain and it matters, you must always take advice, because [colleagues] are there to take advice from.' (G18)

The concept of thresholds for uncertainty was also discussed. GPs differed in their levels of tolerance, perhaps due to personal experiences, personality, and attitude to risk taking:

'I mean, I know from certainly dealing with my colleagues here, that I've probably got a higher threshold for managing uncertainty, I don't think that probably could [go] well ... with misplaced confidence, but you know ... I trust my judgement ... I've seen a lot of it.' (G7)

However, another experienced GP described becoming more careful and lowering their personal threshold for referral over time:

'As you get older you actually get more cautious because ... you've had your fingers burnt by dismissing things along the way and you get, in some ways, more cautious and more suspicious ... you've ... had that experience of missing things and getting it wrong.' (G2)

Many participants advised trainees to calibrate the level of uncertainty they were prepared to tolerate with the potential significance of a possible diagnosis:

'So, if it's a serious diagnosis you have to be pretty certain that it isn't that to be able then to move on to the next diagnosis, but that you can tolerate more uncertainty if it's more trivial.' (G12)

Other tools described by GPs to help manage uncertainty included reviewing the patient on multiple occasions either in person or by telephone, and assessing response to treatment. In patients with an uncertain diagnosis, presentation on multiple occasions was thought to be a trigger for consideration of referral. One GP described this as *'... three visits to OOH, three strikes and you're out'*. (G2)

Many participants reinforced the importance of adequate safety netting to help manage inherent uncertainty:

'One can only deal with that uncertainty if the problem ... [if] it's adequately as, you say, sort of safety netted so knowing that the patient can come back and see you if it progresses or if it changes or if it doesn't get better always keeping an ... open mind about it.' (G12)

However, GPs acknowledged that some conditions are so acute and potentially life threatening that safety netting is inappropriate as immediate referral is needed. Reflecting on this difficulty, one participant suggested that GPs need to decide:

'How certain am I? How certain do I need to be to send him home?' (G23)

Participants displayed a wide variation in attitudes towards how to deliver safety netting. While some believed they should not be too precise or prescriptive, *'... so I just literally say to them if you are worried bring them back'* (G20), others gave more precise advice.

Although the approach was variable, safety netting was described as an essential part of safe decision making and advised as essential for the trainee:

'I think the message ... is always use safety nets ... because diseases can evolve rapidly, particularly in children ... so someone who's not very ill when you see them might become seriously ill even a matter of hours afterwards.' (G8)

DISCUSSION

Summary

This qualitative study generated extensive insights into decision making in primary care, the approaches to clinical reasoning that were associated with diagnostic errors, and the implications of these for practice and training.

Strengths and limitations

This rich dataset combined 36 interviews and 45 examples of diagnostic error, taken from real cases rather than experimental settings or case vignettes; and including examples from routine and OOH care. Experienced researchers carried out interviews, whose open questions encouraged reflection without judgement, which was vitally important given the sensitive nature of the cases discussed.

Inevitably, as participants were asked to reflect on past events this risks recall bias, although elapsed time did allow for personal reflection. Where possible, participants were asked to describe recent cases. They likely selected particularly difficult accounts when asked to reflect on cases they remember; which almost by definition are not necessarily representative of most cases they would have encountered as GPs. However, this reflects the fact that diagnostic errors only occur in a small proportion of cases, and it is perhaps from these cases that there is most to be learned from narrative accounts.

Comparison with existing literature

GPs described pattern recognition as an important reasoning strategy.⁸ This study highlights the problems associated with this approach when it fails to identify atypical and rare presentations, echoing previous research.³ GPs suggested that the 'restricted rule out' approach was associated with avoiding some diagnostic errors, particularly in the OOH setting. This strategy may enable GPs, particularly those in training, to prioritise patient safety more effectively. However, the difficulty comes in deciding which symptoms warrant this approach and on understanding which features, including diagnostic tests, can be used reliably to 'rule out' certain important conditions, including the limitations of red flags. This is reinforced by recent work demonstrating that potential red flag symptoms of lung cancer were not useful in distinguishing benign from malignant presentations, and that only 10% of those referred with red flag symptoms actually had cancer.^{9,10} Other qualitative work to understand the pre-hospital presentation

of leukaemia concluded that red flags were frequently absent as an early presenting feature in primary care.¹¹

Another difficulty for trainees is that there is an art to decision making that develops only with experience. GPs described how they coped with a high degree of uncertainty and over time developed a personal sense of what level of risk they were able to tolerate. GPs accepted that some degree of diagnostic error was inevitable, particularly when probabilistic reasoning is a commonly-used strategy. There is an important balance to strike: although accuracy in diagnosis is a priority, there are also huge risks associated with overdiagnosis,¹² inappropriate investigation, and referral (including iatrogenic consequences and mounting patient expectations); and GPs face huge pressures to use limited resources responsibly.¹³ The priority must lie in patient safety. This was reinforced by Marinker who described:

*'The role of a GP is to tolerate uncertainty, explore probability and marginalise danger; while the role of the hospital specialist is to reduce uncertainty, explore possibility and marginalise error.'*¹⁴

GPs described how they had learned to calibrate their thresholds for tolerance of risk with the severity of a potential differential diagnosis, and through this approach attempted to 'marginalise danger'. They agreed on the importance of safety netting as a strategy to aid safe decision making, although delivery of safety netting strategies varied between participants, as has been found previously.¹⁵

Previous research described the 'sense of unease' or 'gut feelings' identified in this study.^{16,17} The current study's findings build on this by suggesting that ignoring these feelings contributed to diagnostic errors while acting on them led to some errors being prevented. However, there is difficulty here for the trainee who may commonly feel unease due to inexperience, even if it is unwarranted.

Implications for research and practice

There is a stark mismatch between the prominent role that cognitive error plays in contributing to diagnostic errors, and the attention that reasoning receives in such curricula. Therefore, clinical reasoning around diagnosis and diagnostic error needs to be incorporated into undergraduate and postgraduate training, and is important in all specialities.

Training should be adapted to include

more emphasis on patient safety and the clinical reasoning approaches that the current study highlights. For GP trainees, finding more structured ways to learn from diagnostic errors from peers and more senior colleagues could be invaluable, and discussions around errors and clinical reasoning should be thoughtfully and sensitively integrated into everyday teaching. This requires a new openness to accept some of the particular diagnostic challenges of general practice, and the inevitability of diagnostic errors, as well as the multitude of strategies that potentially can help reduce these. Local teaching sessions have already been carried out by one of the authors and have been well received. A more formal basis for teaching will also come from further understanding the relation between making a diagnosis, failure to diagnose correctly, and the clinical reasoning strategies involved.

Further research is vital to move this field beyond the exploratory or observational approaches that have dominated it so far. First, current evidence needs reviewing to understand more clearly which clinical features or tests can reliably 'rule out' certain serious conditions in general practice, and where new diagnostic accuracy information is needed. Second, there is a need to test interventions that are designed to reduce diagnostic errors

by improving reasoning, reflective practice, or other cognitive strategies. Third, there is a need to examine whether changing GP training to incorporate these and other findings leads to improved care, or whether it drives more defensive care, and overdiagnosis and over-referral.

For practitioners, this research suggests the need for more frequent analysis of diagnostic errors; perhaps a cultural shift is required, so that clinicians feel more able to share their own experiences of errors or near misses with colleagues and trainees. Discussions regarding diagnostic errors should feature more prominently in significant event meetings and more should be done to synthesise these lessons nationally to understand and characterise diagnostic errors.

Finally, a GP with 30 years of experience eloquently described some of the most important issues involved and is a reminder that although trainees can be advised, there is no substitute for experience and personal reflection:

'I knew everything when I graduated, you know that I came top of my year, and I just knew everything but I knew nothing and I got better doing my job every year that has gone by because you see things ... you learn humility and presentations.' (G19)

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Ethical approval

For both datasets, data were collected for a quality improvement study involving volunteer GPs; all data were anonymised prior to analysis.

Provenance

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Competing interests

The authors have declared no competing interests.

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