Different from what the textbooks say: how GPs diagnose coronary heart disease

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Background. In patients with chest pain, GPs have to identify those with coronary heart disease (CHD) to arrange for further investigation and treatment. Previous studies have shown that only between 8% and 18% of patients have CHD.

In primary care, the history is the most important diagnostic tool. However, there are only few studies exploring diagnostic criteria that GPs actually use in their daily practice.

Objective. To identify GPs' diagnostic criteria for diagnosing CHD in patients with chest pain.

Methods. In a semi-structured interview, 23 GPs were asked to describe their individual diagnostic criteria in two of their patients with chest pain they had prospectively identified. Interview data were taped, transcribed and analysed qualitatively.

Results. Histories of 39 patients were described, of which 17 patients were thought to have CHD and/or an indication for an emergency hospital admission. GPs mentioned the person-specific discrepancy, that is differences in behaviour or a different appearance of a patient in comparison to previous consultations, as an important diagnostic criterion. Known risk factors for CHD and past illness behaviour also influenced the GPs' diagnoses.

Conclusion. Apart from classical textbook criteria, GPs make use of their prior knowledge of individual patients in a specific way. Discrepancies between previous and actual consultations alert the GPs for serious diseases. At the primary care level, medical practitioners use criteria that differ from secondary or tertiary care.

Keywords. Chest pain, diagnosis, family practice, judgement, myocardial ischaemia.

Introduction

For patients presenting with chest pain in practice, the decisions of the GP have potential serious consequences. GPs have to decide whether or not the patient has coronary heart disease (CHD), a relevant disease with 10% (chronic) and 7.4% (acute) of all registered deaths in Germany.

Studies from Sweden and Canada found, respectively, that 15 and 67 of 1000 consultations were for chest pain. However, only 8% and 18% of them had CHD. A number of studies have investigated the diagnostic efficacy of symptoms and signs for CHD, for example localization and radiation. However, most of these investigations were conducted in hospital or emergency room settings. It has been suggested that the diagnostic decision criteria for CHD in primary care might be different from those used in hospital. In general practice, time pressure, minimal equipment, the early and often diffuse stages of disease and the low prevalence of serious disease are factors making the diagnosis of CHD more difficult and different. For
patients with chest pain, the GP is the main point of entry into the health care system. The effectiveness of the GP’s triage process will thus determine whether a patient gets appropriate treatment or not.

This study explores how GPs actually decide whether a patient presenting with chest pain has CHD or not, in particular what diagnostic criteria they use. As diagnostic-decision criteria we refer to all items of information from or about a patient that have relevance for the diagnostic reasoning. This can be a symptom, a sign, a statement or behaviour.

We conducted this study to prepare a validity evaluation of the history and physical signs in general practice.

Methods

We approached 44 GPs in Hessen (Germany) who were associated with the Department of General Practice, University of Marburg. The sample was chosen to ensure that male and female GPs, recent and long-established GPs and GPs practicing in rural and urban areas were included. Twenty-three GPs agreed to take part (Table 1). Between December 2004 and April 2005, they were interviewed by two research fellows with clinical experience (MAH and JV supervised by NDB, ACS and FG). We did not identify the reasons for 21 GPs not participating.

We explained to the GPs that we were interested in understanding how they come to answer the question ‘CHD yes or no?’ when a patient presents with chest pain. To elucidate their diagnostic reasoning, we adapted the principles of ‘critical incident technique’ and ‘stimulated recall’. We asked the participating GPs to identify two patients with chest pain prior to the interview. If this was not possible, they could discuss patients seen in the recent past. Of the patients identified, one should have a high suspicion of a cardiac disease, which deserved further investigations and/or treatment by a cardiologist or hospital. The other patient should be a less serious, non-cardiac case, which the GP could deal with himself.

The semi-structured interviews started with asking each GP to tell the story of the consultation with each patient from the beginning. Facilitative, open questions were asked where necessary to gain a comprehensive account of the GP’s diagnostic reasoning. If a GP was unable to present individual patients, we asked how they usually deal with patients presenting with chest pain. After the GP’s reflection of his or her diagnostic reasoning, we asked them to comment on decision criteria derived from a systematic literature search.

The interviews were transcribed verbatim and entered into the computer software Maxqda 2 to assist data handling. Our analysis can be categorized as a thematic survey undertaken stepwise with each step informing the next. Coding was developed and agreed by discussion between MAH and JV as analysis proceeded. Initial analysis classified the interview data into two categories. The first included ‘spontaneously’ mentioned diagnostic criteria in ‘study patients’. The second category referred to their ‘usual practice’ irrespective of study patients. We decided to include only the first category for further analysis, since these seemed to reflect the actual practice of participating GPs. Further categorization and analysis was conducted independently by MAH, HK and NDB.

Results

The 23 interviews included GPs’ accounts of 39 patients. Two GPs did not present individual patients and three GPs presented only one. In 17 patients, the GP made a provisional diagnosis of CHD and/or found an indication for urgent hospital admission [seven acute coronary syndrome (ACS), nine stable angina and one atrial fibrillation with tachycardia and cardiac failure]. The other 22 patients were given the following diagnoses: 13 chest wall problems, 6 functional chest pain, 1 bronchitis, 1 stomach ulcer and 1 elderly patient with general malaise and multiple complaints. In four cases it transpired that the diagnosis suspected by the GP was different from the final diagnosis: two patients with assumed ACS were eventually found to have stable angina and a chest wall problem. One patient with presumed non-cardiac problem had stable angina and one patient with suspected ACS eventually had carcinoma with lung metastases.

Overall, the GPs interviewed gave very personal accounts of their reasoning. They mentioned uncertainties, difficulties and the limits of their competence.

... not consistent what I’m doing here. On one hand I have prescribed ISDN because it could have been angina, on the other hand I don’t think [that his problems], well I don’t know what was the cause ... but I’m not going to investigate this further. [GP 14]
The decision criteria spontaneously mentioned by GPs could be divided into two general categories. ‘Background knowledge’ implies GP’s knowledge about the patient, independent of the current episode, for example known diseases, social background, previous health care utilization or illness behaviour. On the other hand, there is the actual presentation with symptoms presented to the GP either spontaneously and on questioning.

Many GPs mentioned that the question CHD yes or no was their main concern when seeing a patient with chest pain, despite the low prevalence of this condition.

Because the heart, you always keep it in mind. That is always, that’s your first consideration. The patients, too, always think of it. [GP 21]

In their diagnostic reflections, GPs did not distinguish between acute (ACS) and chronic CHD. The most decision criteria were used in both kinds of cases.

[...] and he is a risk patient [...] diabetic and hypertension [...] so I have directly thought of an acute cardiac disease. [GP 16]

[...] relevant family history, she [the mother] had a CHD and this was then a symptom for me [...], to send him to a specialist with the question: exclusion CHD. [GP 16]

**Decision criteria: background knowledge**

Background knowledge used by GPs in their decision making could be classified as a risk factor for CHD, ‘person-specific discrepancy’ and knowing that the patient tends to play-down the seriousness of his/her complaint.

**Risk factors for CHD.** Risk factors were mentioned by 14 GPs in 16 patients: obesity, older age, previous CHD, diabetes mellitus, hyperlipidaemia, hypertension, family history, smoking and psychosocial stress. GPs indicated that with one or more of these risk factors being present they regarded CHD or ACS as more likely and preferred to arrange further diagnostic tests.

[...] we talk about his smoking history. And heart attack caused by smoking is one of the most frequent causes of death in Germany and thus, in the one who smokes I always suspect heart disease, which must be investigated further. [GP 09]

The absence of risk factors was also explicitly noted.

Well, considering what you know about the family and in considering his age, as I said, just 32 years old, I thought first that some de-escalation would be appropriate. [...] and not rushing in. So spontaneously I thought that this could be nothing life-threatening, just from my feeling. [GP 06]

**Person-specific discrepancy.** Differences in behaviour or a different appearance of a patient in comparison to previous consultations were mentioned by five GPs in discussing five patients. Of these, three GPs indicated that change in utilization of health care was a strong influence on their decision making for this patient:

[...] and here he was, he had never called for a house visit, so when he did, that alone was alarming. [GP 14]

Three GPs also described noting quite subtle changes in what the patient looked like and in the GPs sense of his mood:

On previous occasions he was on the depressed side. But on that day he looked exhausted, behaved very calm but seem agitated under the surface [...] That was already different, yes, [...] That influenced my decision although you really could not see anything on his ECG, but his complaints and the way he looked like prompted me to admit him. [GP 20]

When the current presentation was similar to the previous ones, especially, if the patient had been diagnosed with functional disorders or non-cardiac chest pain in the past, GPs admitted to take a more relaxed attitude. This was mentioned by seven GPs in discussing seven patients.

[...] in previous consultations with this patient I had already thought that psychosomatic factors might play a role, [...] typical [for cardiac disease] symptoms, such as exertional chest pain [...] were not present and had never occurred in the past, so I already included this in my judgement. [GP 03]

The person-specific discrepancy is a criterion used early in the diagnostic process to decide whether urgent action is indicated.

**Knowing that the patient tends to play-down the seriousness of his/her complaint.** An impression from previous contacts that the patient tends to play-down the seriousness of his/her problem influences the assessment. Four GPs mentioned this criterion for four cases, indicating that in these cases they would be more concerned about serious disease.

I have an impression of what he is like, a personal impression. Is he dramatizing [his symptoms] or is he playing-down, as I knew he has done before? [...] he is not a person to shout his symptoms from
the rooftops, but rather plays down. Then you must be especially attentive. [GP 14]

Decision criteria: symptoms as described by the patient
The most frequently mentioned criterion for CHD or ACS at the level of presenting symptoms was the pain getting worse on exertion or not. This association was actively inquired about by GPs when assessing patients presenting with chest pain. Pain on movement of particular parts of the body was distinguished from pain on exertion and pointed the GP away from considering CHD or ACS. Information on other symptoms was not actively sought but considered only if mentioned by the patient. A long time period between the first occurrence of symptoms and the first consultation also reduced the GPs concern about ACS or more general about an acute life-threatening disease. Other associations described by the patient that reduced GPs concern about CHD or ACS were pain getting worse with relaxation or with deep breathing. Symptoms increasing concern about CHD or ACS were dyspnoea on exertion, radiation of pain to the left arm and pain worsening with cold temperature.

Pain on exertion. Chest pain increasing on exertion was most frequently mentioned in nine interviews and 10 patients.

[...] he was physically active and had for weeks, for about five weeks, increasing problems while exercising, such as chest pain and shortness of breath. And during the consultation his complaints sounded more and more like angina, [...] it appeared only at vigorous activity, so after the 10th or 12th lane in the swimming pool. He is a regular swimmer, and so he noticed. His chest pain appeared earlier every time, and it got worse. In the beginning it started after the 20th lane and then it started increasingly earlier and more recently in other stressful situations, too, when he walked fast etc. [...] [GP 10]

Two GPs said absence of pain on exertion was important.

[...] the complaints did not depend on exertion, [...] and based on the description of symptoms I think, that there was a problem in the thoracic spine. [GP 08]

Pain on movement. Pain on movement was mentioned in two interviews for two patients. When the patient talks about pain on movement, the GP considers causes other than cardiac disease:

He was here in early December, had chest tenderness, which he described as being dependent on movement. As far as I can remember he mentioned this immediately, when he sat down, complaining of pain in his chest. Pointing here [...] and it would increase with particular movements and he himself had the impression, that this was related to his spine. [GP 10]

If there is no association with movements, the diagnosis of CHD or ACS is considered.

[I had the heart in mind, because] the pain was too diffuse and it was independent of movement [...] It was independent of, of movement, yes. [GP 02]

A long period between the first occurrence of the chest pain and the consultation with the GP. This was mentioned in two interviews for two patients and for the GPs made a serious, life-threatening disease appear less likely.

A stab in the breast, which persists for three weeks, cannot be so bad. [...] and when somebody leaves this for three weeks, well, that says a lot. [GP 04]

Other symptoms reducing concern about CHD or ACS. Pain when being relaxed was mentioned in two interviews (two patients) and pain getting worse with breathing in two interviews (two patients).

Other symptoms increasing concern about CHD or ACS. Dyspnoea on exertion was mentioned in three interviews (three patients), radiation to the left arm in two interviews (two patients) and pain worsening with the cold in two interviews (two patients).

Notes of caution
Pain on exertion, pain on movement and the long period between the first occurrence and the presenting consultation were mentioned as decision criteria. But none of these criteria was seen as perfect. Other aspects therefore had to be thought of.

Well, I have asked the patient, whether the pain was getting worse on exertion; but when you’re honest, that could go along with complaints, which are associated within the bronchitis; they may increase on exertion, they’re also short-of-breath for example. [GP 03]

I must have in mind, that somebody has lice and fleas, a pain from the backbone and something else … e.g. proper angina. [GP 16]

… when it is something really acute, life-threatening, you assume, that the patient is coming immediately; but I had also patients with a heart attack, who waited until I came back from holiday! [GP 21]
**Combination and the impact of the decision criteria**

In the verbal descriptions of participating GPs, single criteria and variable combinations of these prevailed. However, patterns also seemed to play a certain role. These consisted of several risk factors.

In two interviews, the picture of an imaginary CHD patient was used in a negative way, that is the GP emphasized that the patient did not look like a ‘typical’ CHD patient.

No, because for me she isn’t a CHD patient. The CHD patient looks different to me. […] Generally, CHD patients are older, in most cases they have hypertension or are obese … have a long previous history and don’t come with acute complaints. [GP 12]

So, she is not the typical CHD patient. She is not overweight, she doesn’t smoke, is physically healthy, that doesn’t fit in. [GP 21]

The typical pattern of ACS drew on criteria from ‘first impression’ and ‘physical examination’.

And typically, I think, the patient who says, when I shovelled snow in the morning, I got a pressure on my breast, tightness of the breast, then I would say this, this I would diagnose as angina pectoris. [GP 03]

However, as careful the GPs are in placing their decisions based on patients’ risk factors, as careful they are in using such diagnostic patterns.

This, it is not absolute typical, they [such patients] don’t need exertion; they could, even when the blood pressure is low, at night, they could have complaints. And thus, when I would insist that the complaints might occur so and so, then … then I would be wrong, misguided. [GP 11]

**Discussion**

Person-specific discrepancy was a criterion used by many GPs in their diagnosis of chest pain. This required prior knowledge of the patient. Prior knowledge was also important in tuning their level of concern about CHD with a particular patient including their knowledge of whether the patient usually played down his symptoms. Finally, GPs emphasized their knowledge of individual patients’ risk factors for CHD.

The person-specific discrepancy has not been described before as a diagnostic criterion for CHD. A similar line of reasoning was identified by GPs reporting of cases of meningococcal infection in children.\(^{15}\) This may indicate that the person-specific discrepancy is a diagnostic tool for potentially serious disease that does not require specialized knowledge of a particular disease but of the patient.

A number of studies have examined the efficacy of GPs’ knowledge about their patients with regard to its influence on the health care.\(^{16–18}\) Hjortdahl\(^ {19}\) indicated that the GP’s knowledge about his patient plays an important and integral part in his clinical decision-making process. Our study is the first to explore what kind of background knowledge is precisely used by GPs in this process. Risk factors of CHD have been used to estimate the probability of CHD.\(^ {7}\) The contradictory statements according to risk factors, and to other decision criteria, demonstrate, how hesitant or safety-conscious GPs act before they reject their first suspected, because most feared diagnosis, a life-threatening disease like CHD. This illustrated what Hunter\(^ {20}\) calls a ‘paradoxical rule of practice’ or ‘maxim’.

**Study limitations**

Other ways to capture doctors’ diagnostic reasoning may have more internal validity, such as direct observation or videotapes with ‘think aloud’-recordings. However, they were not practicable against the background of low prevalence of chest pain. The use of standardized patients would not have captured the relevance of the long-term doctor–patient relationship.

The interview technique we used with prospective identification of patients allowed us to examine the diagnostic process in defined clinical situations.

It is possible that GPs reinterpreted their diagnostic reasoning in the light of information about the individual patient gained afterwards. GPs may also have tried to present their thought process as rational and scientific in the interview. We tried to minimize this kind of bias by conducting the interview with the GPs in a manner that encouraged open and self-critical reflection. We stressed the lack of evidence from primary care studies in this area. When introducing the study, we encouraged each GP to express his or her own experiences and heuristics, even if these appeared to be profoundly idiosyncratic at a first glance. We emphasized our conviction that there might be a lot of wisdom in rule of thumb\(^ {21,22}\) and simple heuristics adapted to the ecology of working environments.\(^ {23}\) As a result of this, GPs got into a reflective mode of reporting their treatment and the related thoughts. They mentioned difficulties, limitations and failures in such frankness that we regard the influence of social desirability bias or ‘espoused theories’ as opposed to ‘theories in use’ as small.\(^ {24}\)

**Implications for research and practice**

The use of diagnostic criteria in practice does not necessarily prove their validity. To investigate this
further, we are currently evaluating the person-specific discrepancy for its diagnostic effectiveness in a large cross-sectional study. This study will not only inform future teaching of diagnostic tools but also increase our understanding of diagnostic reasoning in the low-prevalence setting of general practice. Moreover, the results of this and the study presented here shed light on the importance of continuity of care in general practice.

Acknowledgements

We are grateful to the GPs who gave their time to be interviewed for this study. We also thank Mrs Ute Dietrich, Mrs Muazzez Ilihan, Mrs Silvia Jung and Mrs Doris Heuser for their transcription of all the audio-taped interviews.

Declaration

Funding: Federal Ministry of Education and Research (FKZ 01GK0401).

Ethical approval: None.

Conflicts of interest: None.

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