C-reactive protein point-of-care testing for lower respiratory tract infections: a qualitative evaluation of experiences by GPs

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Received 11 March 2009; Revised 26 October 2009; Accepted 11 November 2009.

Objectives. To explore GPs’ attitudes to and experiences of introducing C-reactive protein (CRP) point-of-care testing (POCT) for lower respiratory tract infections (LRTI) in primary care.

Methods. Semi-structured interview study with 20 GPs who participated in the IMPAC\textsuperscript{3T} randomized trial evaluating the effect of GP use of CRP POCT on management of LRTI. Main outcomes were GPs’ experiences and views about CRP POCT in general practice, including its role in guiding antibiotic prescribing decisions and applicability and implementation in daily practice.

Results. GPs expressed mainly positive attitudes. Test results were rapidly available to support diagnostic and therapeutic processes for LRTI and other common infections, enhancing patient and GP confidence in prescribing decisions and empowering GPs to prescribe antibiotics less often. GPs were concerned about responding to ambiguous test results. They regarded financial reimbursement for using the test as essential for successful uptake.

Conclusions. GPs were generally positive about CRP POCT, and they felt that it empowered them to safely prescribe fewer antibiotics for LRTI without alienating their patients. Successful wider implementation should address reimbursement and updating management guidelines to include the place of CRP POCT.

Keywords. C-reactive protein, general practice, qualitative study, respiratory tract infection.

Introduction

Quantitative as well as qualitative studies have identified factors that may contribute to inappropriate antibiotic prescribing by GPs.\textsuperscript{1–6} The often difficult diagnostic and prescribing decisions in lower respiratory tract infections (LRTI) in general practice call for new approaches to reduce antibiotic use without compromising patient safety.

C-reactive protein (CRP) is a well-known diagnostic marker that helps to differentiate serious infections like pneumonia, sepsis and acute appendicitis from self-limiting illnesses. There is evidence to support its use in primary care, especially for LRTI.\textsuperscript{7–10} Improved diagnosis and associated prescribing decisions have far-reaching consequences, as at least 80% of patients presenting with LRTI have acute bronchitis, which is not helped by antibiotic treatment.\textsuperscript{11} CRP test results can only influence initial antibiotic prescribing decisions if they are available at the point of the prescribing decision within the consultation. CRP point-of-care testing (POCT) measurements are valid and robust in general practice.\textsuperscript{12,13}

The effectiveness of CRP POCT in reducing antibiotic prescribing for LRTI has recently been demonstrated in a randomized trial.\textsuperscript{14} However, to accomplish sustained evidence-based use of the test, we need more insight on the actual experiences of GPs who introduced POCT CRP testing into their practice.

We therefore aimed to use the opportunity of the randomized controlled trial of the introduction of CRP POCT use in general practice to gain insight into GPs’ attitudes to and experiences of using the test for LRTI and other common infections in general practice.
Subjects and methods

Subjects
Twenty GPs from 10 general practices in Southeast Netherlands participated in individual face-to-face interviews. These GPs took part in the IMPAC3T study (ISRCTN85154857), a factorial, cluster randomized controlled trial assessing the effect of CRP POCT and enhanced physician communication skills training, separately or combined, on antibiotic prescribing for LRTI. In this trial, 20 GPs received a CRP test device, practice nurses were trained in its use and GPs were given guidance on the interpretation of results. Full clinical outcomes have been reported. The participating GPs had no prior experience with the CRP POCT prior to the trial but had been using the test for nearly 3 years by the time we conducted the present qualitative evaluation. CRP tests were provided free of charge to participating GPs during, but not after, patient recruitment for the trial. At the time of the interview, GPs were unaware of the trial results. All GPs provided written consent to participate in this study. Ethical approval for the trial was obtained from the Ethics Committee of Catharina Hospital in Eindhoven, The Netherlands. The committee did not consider that separate ethical approval was required for this interview study.

Study design
We chose a qualitative study design, as our goal was to explore respondent’s beliefs and understanding of the experiences and opinions of the GPs. GPs were aware that the purpose of the interview was to explore attitudes and experiences and not to audit practice.

Two trained interviewers (FHFC and MEL) conducted the semi-structured interviews using an interview guide. The interview guide was pilot tested in a video-taped interview with a GP from our research group. All questions were open. The topic guide underwent iterative revisions as the interview process progressed and new insights emerged. The interviews took place in the GPs’ surgeries during the first winter after patient recruitment (2008) and each typically lasted about 30 minutes.

Questions covered three themes: general experience with the test, influence of the use of CRP testing on antibiotic prescribing for LRTI and influence of the use of CRP testing on everyday consultations for other illnesses. We aimed to interview all predefined 20 GPs (those in the CRP and CRP plus communication arm of the trial) regardless of the timing of the point where no new items within themes would emerge. We specifically chose this sample of GPs with experience in the use of the test, as the aim of this study was not to investigate physician prioritization of interventions to optimize management of LRTI. We conducted a separate analysis of views by those GPs exposed and those not exposed to CRP POCT and communication training shedding light on barriers and opportunities to the uptake of the CRP test expressed by non-exposed GPs.

Analysis
An experienced typist transcribed the audio-taped interviews verbatim according to a protocol. The anonymized transcripts were used as a basis for analysis and were read in detail by FHFC, MEL and JWLC. Analysis and data collection were conducted in parallel, assisted by the software package Nvivo. Coding schedules were agreed and piloted. Reliability was assured by coding 70% of the data by more than one researcher. Disagreements between coders were resolved by discussion. In case of persisting disagreement, a third decisive coder (JWLC) was consulted who made the final decision. A thematic content analysis was conducted. This method of analysis is essentially a process of summarization, categorization and counting frequency of responses.

Results

General practitioners
All 20 GPs agreed to participate. GPs’ characteristics were similar and comparable to average Dutch GPs. All 20 GPs agreed to participate. GPs’ characteristics were similar and comparable to average Dutch GPs. By the 12th interview, no new items within themes were emerging.

General experiences with the test
All GPs said that the CRP POCT was a useful, and much needed, additional diagnostic tool, especially when they were uncertain whether or not a patient had a serious infection. A typical comment included:

Before this test, I didn’t really have that much to go on, helped only a bit by temperature, a bit by the patient’s illness history, the severity of the illness. It was mostly guesswork really . . . . I think this CRP does improve my clinical pattern recognition. You immediately get feedback as to whether your impression agrees with the objective measure. (GP9).

Nearly all also acknowledged that they used the CRP POCT mainly to exclude pneumonia, while nine GPs also used it to confirm their own diagnoses. Although they felt that the CRP POCT was a very useful tool in LRTI consultations, most mentioned that clinical findings remained central to deciding about antibiotic treatment.

Half of the clinicians said that the use of CRP POCT had very little influence on their workload. They felt it did not influence their consultation time, whereas eight others stated that it might slightly increase consultation time. When talking about general experience with the test within their practice, the vast majority agreed that it was a user-friendly tool in LRTI consultations, most mentioned that clinical findings remained central to deciding about antibiotic treatment.

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test, and practice nurses had a positive experience in performing the test. One clinician stated, ‘The fact that it’s immediately available means you get fewer short term repeat consultations or phone calls. So in that sense, it just makes things that bit quicker’ (GP19). Five others, however, had some concerns on organizational issues, such as interference with practice nurses’ activities including answering phone calls. Apart from one GP mentioning the finger prick itself was unpleasant for patients, no other negative effects for patients were raised: ‘I think since it’s not a very invasive test, not a great burden to the patient, and easy to use for the practice nurses. All of this means that it is an added value for general practice, in a wide variety of situations’ (GP1).

Although some GPs did not describe disadvantages of the test in general, others considered that potentially, the test could be relied on too much, detracting from the value of clinical diagnostic skills. Two typical clinicians’ opinions were ‘What you mustn’t do is hide behind it. It could cause you to do even less physical examination, to stop paying attention to that’ (GP1) and ‘There’s a risk that you let the test determine your management. In the end, what matters is the person who’s sitting there and what you hear and what you find on physical examination’ (GP8).

Although 12 clinicians said that the costs of the CRP POCT did not have any meaningful influence on the use of the test in their everyday practice, all 20 agreed that there should be a financial compensation of the incurred costs. Three clinicians stated that absence of reimbursement currently prevented them from using the test. All three were working in health care centres in more deprived urban areas. In these practices, a practice manager decided on investments and not the GPs themselves. Some practitioners mentioned that experience in interpretation of test results is crucial to gain full benefit. However, when going into depth, they mostly stressed the value of the 30-minutes practice-based training session with clear recommendations on use, interpretation and specific attention for the place of CRP POCT in the whole diagnostic workup in LRTI: ‘It is relevant to realize the limited value of our diagnostic skills, such as auscultation, before being provided clear cut-offs and how to use it’ (GP5) and ‘Very useful to receive proper training on abnormal test results, and what to do next’ (GP16). Hence, a solid training session was highly valued. Thirteen GPs acknowledged that they would miss the test if removed from their practice and would welcome updated national LRTI guidelines that considered the place of CRP. This last wish was mainly facilitated by the hope that once guideline uptake was achieved, reimbursement would also be initiated.

**Influence of the test on antibiotic prescribing and consulting for LRTI**

Sixteen GPs reposted that low CRP results helped avoid antibiotic treatment. Almost every practitioner felt that the test generally confirmed their clinical findings and management and decreased their diagnostic uncertainty. A normal CRP test result was reassuring and convinced both the GP and the patient that further diagnostic testing and antibiotic treatment was unnecessary. Although two GPs said that they had always been conservative antibiotic prescribers for LRTI, 16 reported that their antibiotic prescribing had decreased since using the CRP POCT.

It also helps you to be a bit more careful in prescribing antibiotics, that’s true. It makes you more aware that you may be using them too often. (GP19)

GPs mentioned that the test increased their motivation to use antibiotics more cautiously.

We need a bit more awareness of the problem of antibiotics, and the CRP test may show that it’s not so bad, that there are fewer pneumonia cases than you might think at first. (GP5)

When test results were in conflict with clinical findings, most GPs relied on clinical findings when deciding on treatment. They based their management on the combination of clinical factors, such as physical examination findings, duration of illness, medical history, medication, patients’ expectations and the CRP test result. One practitioner acknowledged that, at first, patients’ previous experiences with antibiotic treatment were an obstacle: ‘If a GP they consulted previously for the same complaint gave them an antibiotic, that makes it harder to say, “Well you don’t really need it”’ (GP19).

Twelve GPs said that elevated CRP (mostly referred to as CRP > 20 mg/l) mostly confirmed their judgement of illness severity. Highly elevated CRP test results (>100 mg/l) supported decisions to prescribe antibiotics. In fact, both low (<20 mg/l) and high test results (>100 mg/l) supported the GPs’ initial judgement and helped reduce residual uncertainty. One practitioner said: ‘You use it so you know whether it’s serious or not. Very high or very low values offer clear clues’ (GP11).

Intermediately elevated results (20–100) were considered a limitation of the test by half of the GPs. Their main concern was explaining intermediate test results to patients, as this could create uncertainty in patients’ minds: ‘If the CRP is at an intermediate level, the patient may think that their blood was not entirely OK, so that may make them insecure and worried’ (GP18). Although 11 GPs said they routinely advise their patients when to reconsult in the event of persisting symptoms, 7 said that an elevated CRP test
result reinforced this ‘safety netting’. However, generally GPs did not feel that these patients would actually reconsult more often:

I don’t think patients are more likely to return if the test shows an intermediate level. I think it’s because if patients have relatively high intermediate levels, and corresponding clinical features, I would treat them anyway. Whereas people in the lower part of the intermediate values, with mild symptoms, they will soon get better without treatment. (GP14)

Seven GPs said they often had used the test in follow-up consultations, while two only considered doing this, depending on the severity of the patient’s symptoms.

More than 15 GPs mentioned the tests’ useful role in convincing patients about management decisions and the advantage of a rapidly available test result. GPs believed that a major advantage of using the CRP test was that patients felt that their complaints were being taken seriously and they were more reassured. They felt that patients’ satisfaction increased by using the CRP test. One doctor elaborated, ‘You first evaluate the patient’s story, you examine them and then also offer them a test. I think that means patients feel they’re being taken very seriously, and that reassures them a lot’ (GP14). And ‘If a patient clearly expects to get an antibiotic, it can support you in your explanation. And patients understand that. You explain to them that the test doesn’t indicate anything serious—the CRP is normal—and then it’s easier to get patients to accept a wait-and-see policy’ (GP20).

Even in situations were GPs were certain about the self-limiting nature of symptoms, the test would further empower GPs to safely avoid prescribing antibiotics without alienating patients. We investigated if views on reassurance differed in GPs additionally trained in communication skills but they did not.

In general, GPs were unconcerned by the possible medicalizing effect of the test with associated reconsultations and increasing workload. In fact, three GPs stressed the potential educational effect of natural recovery without antibiotic treatment:

If you don’t treat a patient with antibiotics [after CRP testing] and the complaints resolve spontaneously, I think that patients will tend to wait and see and not consult the doctor again for the next similar illness episode. So what we hope is that this management including CRP will lead to fewer consultations or repeat consultations for new infections. (GP17)

After patient recruitment for the trial, clinicians generally used the test to help reduce diagnostic and prognostic uncertainty. The majority of GPs said they continued to use the test and half of all GPs mainly use it to ‘rule out’ serious disease. A typical clinician’s opinion was:

There’s a group of patients where I think no, this is just a mild respiratory tract infection, and I won’t use it then. And there’s also a group where I think, well, these people are so ill, they have so many signs and symptoms, or have had complaints for so long, and then I won’t use it either. It’s the group in between, where I’m thinking whether it might be pneumonia, and whether I should advise them to take an antibiotic, that’s where I still use it. When I’m not very sure myself. (GP5)

While most commented on selective use for the subset of patients, one GP expressed concerns regarding over-testing:

Perhaps it’s being used a bit too often. I think you need to be careful about that. It’s so easy, since it’s available in your own office, but I think you need to be critical and consider whether you really need a CRP test for your further management or not. (GP1)

Half of the GPs we interviewed were also trained in additional communication skills for managing LRTI.19 We did not observe difference in accounts from GPs trained and not trained in communication skills with regards to using the test.

**Influence of using the CRP test on everyday consultations for other illnesses**

All but one mentioned using CRP POCT for helping to diagnose abdominal complaints, including appendicitis, diverticulitis or vague abdominal complaints, and saw the test as a useful aid for ruling out serious acute pathology and to guide hospital referral decisions. Other possible uses, but less frequently mentioned, were for tonsillitis, rhinosinusitis, joint pain and children with fever.

Eight GPs mentioned that colleagues working in the same general practice had also started using the CRP POCT, but they used it less often than the clinicians initially trained to use the test. Three clinicians believed that a reason for this was that these colleagues were not trained in how to use the test, had less experience with the test and sometimes did not even know about it.

**Discussion**

**Main findings**

This is the first in depth study exploring GPs attitudes towards and experiences of CRP POCT after they had recently started using the test. We identified mostly positive attitudes towards the use of CRP POCT in general and its role in LRTI in particular.
Commonly mentioned positive themes included its supportive role in the diagnostic and therapeutic process, its role in empowering GPs to safely reduce antibiotic prescribing without alienating their patients and the rapidly available test results. Concerns included handling intermediate elevated test results. GPs reported that the test had helped them prescribe fewer antibiotics for LRTI through reducing diagnostic and prognostic uncertainty and in achieving patient’s reasurance and agreement.

**Strengths and limitations**

Qualitative research is best suited for obtaining a better understanding of experiences and attitudes. We successfully interviewed all twenty GPs who had recently starting using the CRP POCT. Since we continued interviews once no new items within themes were emerging, we are confident that we did not miss important views. Although GPs could probably have made an informed guess based on their own behaviour, participating GPs were not aware of the trial results on the effectiveness of the CRP POCT in reducing antibiotic prescribing at the time of interview, so results are not likely to have heavily influenced responses. Double coding of the majority of transcripts ensured reliability. Recall bias may have been an issue as the interviews took place in the winter period after the end of patient recruitment for the trial. But seeing that most GPs continued to use the test after the trial, this bias will be small.

At the time of the study, CRP POCT was virtually never used in Dutch primary care. All participating GPs had no prior experience with the test. Despite this, GPs reported the test empowered them to prescribe antibiotics less often. In general, GPs may need time to gain experience in interpreting and responding to the results of a new test. We did not interview patients managed with the aid of CRP testing. GPs views on patient-related factors such as satisfaction are therefore based on GPs perceptions alone. Furthermore, an exploration of views of practice nurses may contribute important information as well, but this was outside of the scope of this paper. The views of the Dutch GPs who participated in this study do not necessarily represent attitudes across Europe or beyond, as each country-specific health system and cultural factors may influences attitudes to implementation and uptake of such tests.

**Comparison with other studies**

GPs indicated that the CRP POCT empowered them to safely prescribe antibiotics less often for LRTI. This is supported by quantitative data from the trial in which these GPs participated. Some GPs in our study expressed concerns about relying too much on the test result, which could undermine confidence and skill in clinical examination, potentially leading to test over-use. Excessive CRP testing for self-limiting respiratory tract infections such as the common cold has occurred in settings where CRP is has been widely introduced in primary care without proper guidelines on indications and interpretations of the test result. Moreover, a potential drawback of the CRP test is uncertainty on how to respond to intermediate elevated results. Generally, the GPs in this study did not feel that these patients would actually reconsult more often, but we observed a higher patient initiated reconsultation rate in patients with intermediately elevated results in a secondary analysis of our trial. A Swedish group suggested that moderately elevated CRP values in patients with RTI might lead to prescriptions of antibiotics that would have been avoided if the test had not been carried out. GPs in our study reported that, even though a moderately elevated test result did not take away diagnostic uncertainty, it did not encourage them to prescribe more antibiotics. This is in line with quantitative findings from our trial in which moderately elevated tests results were not associated with antibiotic prescribing. One explanation could be that the CRP test assisted GPs in their decision making, while previously they mostly prescribed antibiotics in the face of doubt. Delayed prescribing is not widely used in The Netherlands. Yet, this strategy could possibly provide an acceptable alternative for both patient and GP in some cases of intermediately elevated results.

In their recent systematic review of CRP and community-acquired pneumonia (CAP) in ambulatory care, Falk and Fahey concluded that CRP may be of value in ruling out the diagnosis of CAP in situation where the probability is higher than 10%. There is usually a lower probability in primary care. Nonetheless, GPs in our study confirmed that they continued to use the test well after the trial had ended in that subgroup of patients where they were uncertain about whether or not to prescribe antibiotics. Consequently, this subgroup of patients will have a higher probability of CAP than all patients consulting with LRTI. Moreover, our trial results indicated an extensive decrease in antibiotic prescribing. This effect may relate not only to the diagnostic value of the test but also to its role in empowering GPs not to prescribe antibiotics and in gaining patient acceptance of these decisions. This latter aspect of the test may be of greatest value in the large subgroup of patients with self-limiting acute bronchitis who hope for and expect antibiotic treatment.

In a recent qualitative study on UK GPs’ perceptions of introducing near-patient testing for common infections into routine primary care, it was shown that many physicians emphasized that near-patient tests would be particularly valuable in ‘selling’ decisions to patients. GPs involved in that study stressed that, before considering uptake of a near-patient test, they
would have to be convinced by research evidence supporting the use of these tests. Moreover, they would have to be cheap, easy to use and acceptable to patients. Our data provide confirmatory evidence.

Previous qualitative studies on prescribing decisions in general practice have shown that insecurity and uncertainty of the doctor who falls back on the prescription as a coping strategy is an important factor in the cascade of antibiotic overprescribing. Moreover, this prescribing decision is greatly influenced by considerations of the doctor–patient relationship. Attitudes expressed in this study hint that CRP POCT may be a helpful strategy to optimize these prescribing decisions without risking a disturbed doctor–patient relationship. In a separate paper, we focused on the role of physician preference in prioritizing interventions to optimize management of LRTI. This study found differences in GPs’ expressed preferences for prioritizing contrasting interventions to optimize LRTI management. Those GPs who had experience of both communication skills training and CRP POCT indicated that they would choose to prioritize enhanced communication skills. Conversely, GPs without access to CRP POCT and enhanced communication skills training indicated they would prefer to have access to the CRP intervention. Setting priorities for uptake of contrasting interventions may differ substantially between GPs with and without previous exposure to the interventions. In the current paper, we only describe the attitudes and experiences of GPs who had been exposed to CRP POCT.

Studies have suggested benefit for CRP POCT additional to clinical and laboratory data in diagnosing acute appendicitis. Some GPs in our study commented that they had found the test useful in this situation. CRP performs well in diagnosing appendicitis. While an elevated CRP value cannot effectively establish the diagnosis of acute appendicitis, low values exclude it and may help avoid unnecessary hospital referral.

**Practice implications**

Evidence from both our trial of the effect of CRP POCT on antibiotic prescribing, as well as the views expressed in this qualitative study, support a cautious introduction of the CRP POCT in general practice in The Netherlands. GP respondents specifically recognized and stressed the supportive role of the test as an additional tool to empower them to reduce diagnostic and prognostic uncertainty and safely prescribe fewer antibiotics without alienating their patients. Introducing CRP POCT in routine care will be most successful therefore when it is accompanied with recommendations on when to use and how to interpret the test results, and with additional information about the diagnostic value for LRTI. Most GPs continued to use the tests after the trial and planned to continue doing so. However, reimbursement for using the test was considered essentially for them to continue using the test in daily practice. It was felt that uptake in guidelines could facilitate the process of reimbursement.

**Conclusions**

These accounts of GPs who started using CRP POCT for LRTI indicate a generally positive experience and sustained changes in practice that has led to reduced antibiotic prescribing. Both the positive experiences and the concerns expressed by the GP participants in this study, combined with attitudes expressed by GPs without previous experience with the test, should inform further implementation research and roll out of CRP POCT into routine primary care.

**Acknowledgements**

We wish to thank the GPs who participated in this study. We are grateful for the support of Esmeralda Mulleneers for transcribing the interviews and Susanne Hanssen for coordinating and planning the interviews. Data access and responsibility: JC had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Declaration**

Funding: The Netherlands Organization for Health Research and Development (IMPAC3T trial ZonMW grant 945-04010); Axis-Shield diagnostics; The Netherlands Organisation for Health Research and Development to JWLC as a MD-medical research trainee; Wales Office for Research and Development (WORD) to KH; RMH has received travel funds from Axis-Shield (Norway) and Orion Diagnostica (Finland), both manufacturers of point-of-care CRP devices. Ethical approval: Ethics Committee of Catharina Hospital in Eindhoven, The Netherlands.

Conflict of interest: all authors declare no conflict of interest except RMH. The funders had no role in the design and conduct of the study, collection, management, analysis and interpretation of the data and preparation, review or approval of the manuscript.

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