Taylor & Francis
Taylor & Francis Group

Scandinavian Journal of Primary Health Care

ISSN: 0281-3432 (Print) 1502-7724 (Online) Journal homepage: https://www.tandfonline.com/loi/ipri20

C-reactive protein in general practice - how commonly is it used and why?

Bjarne Steen Dahler-Eriksen, Jens Flensted Lassen, Erik Dalsgaard Lund, Torsten Lauritzen & Ivan Brandslund

To cite this article: Bjarne Steen Dahler-Eriksen, Jens Flensted Lassen, Erik Dalsgaard Lund, Torsten Lauritzen & Ivan Brandslund (1997) C-reactive protein in general practice - how commonly is it used and why?, Scandinavian Journal of Primary Health Care, 15:1, 35-38, DOI: 10.3109/02813439709043427

To link to this article: https://doi.org/10.3109/02813439709043427

Published online: 12 Jul 2009.

Submit your article to this journal

Article views: 774

View related articles

Citing articles: 1 View citing articles

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=ipri20

C-reactive protein in general practice – how commonly is it used and why?

Bjarne Steen Dahler-Eriksen[1,2], Jens Flensted Lassen[1], Erik Dalsgaard Lund[1], Torsten Lauritzen[2] and Ivan Brandslund[1]

[1]Department of Clinical Chemistry, Vejle County Central Hospital, [2]Department of General Practice, University of Aarhus, Denmark.

Received October 1995. Accepted August 1996.

Scand J Prim Health Care 1997;15:35–38. ISSN 0281-3432

Objective – C-reactive protein (CRP) is a well-known diagnostic tool in general practice. The scope of this study was to assess how frequently CRP is used by general practitioners and to evaluate the reasons for using it.
Design – A retrospective part based on data from a laboratory database system, and a prospective part with a questionnaire-based registration.
Setting – 30 general practice clinics in the catchment area of Vejle County Central Hospital.
Subjects – Retrospectively, all patients from general practice serviced by the laboratory for one year. Prospectively, 1190 patients from whom a blood sample was taken for CRP-measurement during a 2 month study period.
Main outcome measures – The frequency of using CRP and the reason requesting it; A) diagnosing a new disease, B) monitoring a well-known disease, or C) "screening". Furthermore; 1) infections, 2) chronic inflammatory disease, 3) malignant disease, or 4) others.
Results – CRP-measurements were ordered in 3.7% of all consultations in general practice and for 34.1% of all patients whose blood sample was analysed at the central laboratory. The use of CRP was as follows: A-1: 28.6%, A-2: 6.7%, A-3,4: 9.3%, B-1: 8.2%, B-2: 12.4%, B-3,4: 6.5%, C-1: 5.7%, C-2: 3.2%, C-3: 3.5% and C-4: 15.2%. Diagnosing a new (infectious) disease was the most frequent single reason for CRP-measurement. There was major interpractice variation.
Conclusions – CRP is frequently used in general practice, mostly (65.4%) in the field of infections and chronic inflammatory diseases. Because of major interpractice variation, the most correct way of using CRP should be evaluated and guidelines should be provided.

Key words: C-reactive protein, general practice, infections.

Bjarne Steen Dahler-Eriksen, MD, Department of Clinical Chemistry, Vejle County Central Hospital, DK-7100 Vejle, Denmark.

Patients with infectious diseases constitute a major part of the consultations in general practice (1). General practitioners (GPs) use laboratory tests when assessing these patients. One such test is C-reactive protein (CRP), a marker of the acute phase response (2-5). Because the plasma concentration of CRP increases rapidly after stimulation (after 6–8 h) and decreases rapidly because of a short half-life (5–7 h), CRP can be a very useful tool in diagnosing and monitoring infections and inflammatory diseases (2-5).

CRP ordered by GPs in Denmark is analysed at a hospital laboratory. In the County of Vejle, all test results from hospital laboratories are stored in the laboratory database system LABKA (Dansk Data Lab., Copenhagen, Denmark). All citizens in Denmark have an ID-number. LABKA provide access to the ID- number of the patient, the date of the blood sample, the test result, and a number for identification of the hospital ward or the GP who requested the test. These data allow evaluation of the frequency of use of different tests by hospital departments and GPs.

The aim of the present study was to assess the frequency of use of CRP by GPs and to describe the indications for using CRP according to the GPs' statements.

MATERIAL AND METHODS

The catchment area of Vejle County Central Hospital (Vejle Hospital) consists of 105 000 people. The area contains 43 general practice clinics (GPC) with 84 GPs, all of whom use the laboratory at the central hospital.

Throughout 1995, all laboratory tests ordered by the GPCs in the area were assessed by use of the laboratory database system. The number of patient contacts resulting in a blood sample and analysis at the hospital laboratory, and the total number of CRP-measurements were also registered.

Also throughout 1995, the number of consultations at GPCs in the catchment area was noted from the register of Public Health Insurance in Vejle County. All 43 GPCs were invited to participate in a survey with the aim of describing their use of CRP. Thirty clinics (60 GPs) accepted. In a prospective study period of two months, these clinics reported their indications for requesting CRP-measurements on a small questionnaire

label placed on the request form for laboratory tests. The questionnaire label was designed so that the GPs had to make only two marks. The first concerned the reason for the test:

A: Diagnosing a new disease
B: Monitoring a well-known disease
C: "Screening"

The other mark for the type of disease:
1: Infection
2: Chronic inflammatory disease
3: Malignant disease
4: Other

The items in the questionnaire were defined for the GPs in a covering letter: "A: Diagnosing a new disease": suspicion of a specific disease and/or symptoms characteristic for this disease. "B: Monitoring of a well-known disease": well-defined disease, an assessment of the effect of treatment and/or health state is wanted. "C: Screening": suspicion of physical disease, symptoms uncharacteristic and/or further examination is necessary. The word "screening" is thereby not used as an epidemiological term, but in the meaning: "assessment of patients with unspecific symptoms for an acute phase response to screen for signs of physical disease".

Numbers of requests for CRP and answers from the questionnaires were registered in total and for each GPC separately.

The numbers of patients registered with each participating GPC were noted from the register of Public Health Insurance in Vejle County. Request frequencies were conducted for each GPC and expressed as: CRP-measurements/1000 patients/year.

Selection bias for participation in the study was assessed by comparing request frequencies for CRP-measurements for participating and non-participating GPCs. As it was not possible to obtain the number of patients registered at the GPCs who did not participate in the study, the comparison of request frequencies was expressed as: CRP-measurements/GP/year. The mean age of GPs per GPCs and distance from the GPCs to the hospital were analysed. Data for these parameters were obtained from the register of the Public Health Insurance in Vejle County.

Intervention bias was assessed by comparing CRP-measurements for each GPC in the study period with CRP-measurements for the same period one year previously. These data were obtained from the laboratory database system.

Statistical analysis

Results are given as median and range when not otherwise indicated. Medians were compared by non-parametric analysis (Wilcoxon rank-sum test). The level of significance was chosen at $p<0.05$. All statistical calculations were performed on a personal computer using the statistical package Statistica^{RM} (Microsoft Corporation, USA).

RESULTS

During 1995 the laboratory at Vejle Hospital received 43 143 blood samples from patients seen in GPCs, from which 182 581 laboratory analyses were requested. The number of CRP-measurements requested from GPs was 14 708. Thus CRP-measurements were ordered in 34.1% of all patients for whom a blood sample was ordered by a GP, corresponding to 8% of all laboratory analyses requested from GPs.

The GPCs in the catchment area of Vejle Hospital contributed 393 516 consultations in 1995 (both day and duty consultations) with a request for a CRP-measurement in 3.7% of all consultations.

In total, 1190 request forms with questionnaires for CRP-measurements were returned within the 2-month study period. In 1056 (88.7%) of the questionnaires the GPs had reported their reasons for ordering a CRP-measurement, while in 134 (11.3%) the questionnaires were not filled in, though CRP was requested. If only one letter (A, B or C) or one number (1,2,3 or 4) was marked, the answer was categorized as not specified.

Of the 1190 patients, 675 (56.7%) were women, with a median age of 55 years (0–93), and 515 (43.3%) were men, with a median age of 56 years (1–91). The distribution in percent of different CRP-values is shown in Table I. Of all CRP-measurements 66.5% were below the upper normal reference limit (i.e. below 10 mg/l), 24.4% were slightly raised (CRP between 10 and 50 mg/l), and 9.1% were considerably raised (CRP above 50 mg/l).

The use of CRP according to indications reported for 1056 patients is shown in Table II. Of all the CRP-measurements, 44.6% were ordered with the purpose of diagnosing a new disease (A). Diagnosis of infectious diseases (A1) accounted for 28.6%, chronic inflamma-

Table I. The distribution of values of C-reactive protein for 1190 CRP-measurements from 30 general practice clinics in a 2-month study period.

Values of C-reactive protein	Per cent of CRP-measurements
0 ≤CRP (mg/l) ≤10	66.5
10 <CRP (mg/l) ≤25	15.3
25 <CRP (mg/l) ≤50	9.1
50 <CRP (mg/l) ≤100	6.3
CRP (mg/l) >100	2.8

n = 1190

Table II. Reasons for requesting C-reactive protein reported from 30 general practice clinics in a period of 2 months. Data indicated in percentages (%) for 1056 patients.

30 general practice clinics	(1) Infection (%)	(2) Chronic inflammatory disease (%)	(3) Malignant disease (%)	(4) Other and (not specified) (%)	All (%)
(A) Diagnosis of a new disease (%)	28.6	6.7	2.5	6.8 (0.0)	44.6
(B) Monitoring of a well-known disease (%)	8.2	12.4	2.7	3.8 (1.6)	27.1
(C) "Screening". Specific diseases not suspected (%)	5.7	3.2	3.5	15.2 (9.4)	27.6
Not specified (%)	0.5	0.1	0.0	0.1 (0.0)	0.7
All (%)	43.0	22.4	8.7	25.9 (11.0)	100.0

n = 1056

tory diseases (A2) 6.7%, and malignant diseases (A3) 2.5%.

Of all the CRP-measurements, 27.1% were used for monitoring already well-known diseases (B), and 27.6% for "screening" purposes (C).

The median number of CRP-measurements per GPC was 80/1000 patients/year (24–435). The median number of CRP-measurements used for infective diseases was 31.3% (0–80), for chronic inflammatory diseases 23.3% (0–100), and for malignant diseases 6.3% (0–38.5). Using CRP for other diseases ranged from 0% to 70% of all CRP-measurements.

The median number of CRP-measurements/year was 105 (31–680) among the participating GPs (n=60), and 82 (13–347) among the non-participating GPs (n=24)(p=0.37). The median age for participating GPs was 49 years (36–67), and 51 years (38–67) for non-participating GPs (p=0.85). The median distance from the hospital to the GPC was 10 km (1–30) for participating GPCs and 10 km (1–25) for non-participating GPCs (p=0.78). According to these data no statistical differences were found between participants and non-participants.

The number of CRP-measurements requested for each of the 30 GPCs one year before the study period was compared with the number requested during the study period. For 26 GPCs the difference in the number of CRPs was within +/-50 CRP-measurements/year/1000 patients. For four GPCs a considerable decrease in requests for CRP in the study period was observed, ranging from 56 to 133 fewer CRP-measurements/year/1000 patients.

DISCUSSION

CRP was a very frequently used test, ordered in nearly 4% of all consultations in primary health care, and for one in three patients for whom a blood sample was analysed at the hospital laboratory. As in other studies, a major part of measured CRP-values were normal (i.e. below 10 mg/l) reflecting that only a small number of the patients consulting primary health care are critically ill (6,7). Participation of 71% of all the GPs in the catchment area is satisfactory. The evaluation for selection bias showed that the participating GPs were representative with respect to their normal requests for CRP, age, and distance from hospital. Intervention bias was also acceptable, because only four GPCs had changed their request frequency compared with one year before this study.

As CRP is a marker of the acute phase response, a major use in the fields of infectious or inflammatory diseases was expected. The GPs reported that 43% and 22.4% of all CRP-measurements were used in connection with infectious diseases and chronic inflammatory diseases, respectively, corresponding to two-thirds of all CRP-measurements requested by primary health care.

Of requested CRP-measurement 25.9% were used for diseases other than infective diseases, chronic inflammatory diseases, or malignant diseases. A major part of these tests were reported as "screenings", indicating cases for which the GP required an assessment of the acute phase response for further examination of the patient.

CRP was used for diagnosing and monitoring 2.5% and 2.7%, respectively, of all cases of malignant diseases. CRP is not a preferred method for diagnosing or monitoring of malignant diseases, but raised CRP-values can further support suspicion of malignant disease, a purpose for which 3.6% of all CRPs were used.

The results showed an interpractice variation in the number of CRP-measurements requested, ranging from 24 to 435 CRP-measurements/1000 patients/year, and in indications for use of CRP. Variation in use of laboratory tests and clinical behaviour is well known in both the primary and the secondary health care systems (8,9). In diagnosing or monitoring patients with infectious diseases or chronic inflammatory diseases, there is no

reference standard for the use of acute phase reactants. Our results reveal a need to evaluate the most correct way of using CRP-measurements; they also indicate a need for guidelines.

Since we have not found other articles that have dealt with this subject, it has not been possible to compare our results with CRP use in other parts of Denmark and Scandinavia.

On the basis of the present study, we conclude the following about the use of CRP in general practice:

- The test is very frequently used, ordered in nearly 4% of all consultations in general practice and for one of three patients serviced at the hospital laboratory.
- A major fraction of CRP-measurement is ordered for purposes related to infectious diseases (43%) or chronic inflammatory diseases (22.4%).
- 27.4% of all CRP-measurements are used for "screening" purposes, assessing an acute phase response for patients with unspecific symptoms. CRP is thereby reported to be part of the decision-making process for further examination of patients.
- There is major interpractice variation, revealing a need to evaluate the best way of using CRP-measurements and indicating a need for guidelines.

ACKNOWLEDGEMENTS

We thank Carsten Thomsen for excellent technical assistance. We also thank all the participating general practice clinics and the laboratory personnel. The work was supported by The Fund for Medical Research in Vejle County (j.nr:13/1995), The Danish Health Insurance Fund (j.nr:11/024–96), and The Danish Research Foundation for General Practice (j.nr:FF–2–02–16).

REFERENCES

1. Söderström M, Blomberg J, Christensen P, Hovelius B. Erythromycin and penicillin V in the treatment of respiratory tract infections as related to microbiological findings and serum C-reactive protein. Scand J Infect Dis 1991;23:347-54.
2. Whicher JT. Acute phase proteins, physiology and clinical uses. Clin Biochem Revs 1990;11:4-9.
3. Young B, Gleeson M, Cripps AW. C-reactive protein: a critical review. Pathology 1991;23:118-24.
4. Thompson D, Milford-Ward A, Whicher JT. The value of acute phase protein measurements in clinical practice. Ann Clin Biochem 1992;29:123-31.
5. Stuart J, Lewis SM. Monitoring the acute phase response. BMJ 1988; 297:1143-4.
6. Hjortdahl P, Landaas S, Urdal P, Steinbakk M, Fuglerud P, Nygaard B. C-reactive protein: a new rapid assay for managing infectious disease in primary health care. Scand J Prim Health Care 1991;9:3-10.
7. Dinant GJ, Costongs R, Leclercq RMFM, Van Wersch JWJ. Reliability of C-reactive protein measurements in general practice in the Netherlands. Scand J Clin Lab Invest 1994;54:113-7.
8. Asberg A, Midthjell K, Holmen J. Variasjon i primærhelsetjenestens rekvirering av klinisk-kjemiske analyser (Variation in the number of clinical chemical tests requested by the primary health care sector). English summary. Tidsskr Nor Laegeforen 1994;114:1617-9.
9. Erlendsson AK, Brandslund I, Tangø M. Analyseforbruget ved akut myokardieinfarkt vurderet med kvalitetssikringsmetodik (The use of analyses in acute myocardial infarction evaluated in terms of quality assessment). Ugeskr Læger 1994;156:7332-5.