

## Cancer suspicion in general practice:

the role of symptoms and patient characteristics, and their association with subsequent cancer

### Abstract

#### Background

Awareness of detail in ambiguous complaints may help GPs suspect cancer when a malignancy is present.

#### Aim

To study the contribution of symptoms and patient characteristics to GPs' suspicions of cancer being present, and to what degree these suspicions were confirmed.

#### Design and setting

Prospective cohort study of patients in 283 rural and urban general practices throughout Norway.

#### Method

During patient consultations (over a period of 10 days) GPs registered whether there was a suspicion of cancer when a patient presented with at least one of seven focal symptoms and three general symptoms commonly considered to be warning signs of cancer. Follow-up questionnaires were sent to GPs 6–7 months later, requesting information on any subsequent diagnosis of cancer in these patients.

#### Results

Out of 51 073 patients, 6321 presented with warning signs of cancer; of these, 106 had a subsequent cancer diagnosis. Of the patients presenting with warning signs, 1515 (24%) patients were suspected of having cancer; this was correct for 3.8% of suspected cases. Of the 106 patients diagnosed with cancer who presented with warning signs, cancer was suspected in 58 (54.7%). GPs' correct cancer suspicions were six times more frequent than their erroneous lack of suspicion. Multiple symptoms, previous cancer, comorbidity, and multiple consultations increased the probability of cancer, but only multiple symptoms and previous cancer increased suspicion. Suspicion led to an increase in the number of diagnostic procedures undertaken. The proportion of cancer cases where GPs recorded a lack of suspicion was relatively small, but important.

#### Conclusion

Selected symptoms appropriately resulted in GPs suspecting cancer. Comorbidity and multiple consultations were underestimated by GPs as factors associated with cancer. Cancer suspicion should rely on symptoms in combination with other relevant information.

#### Keywords

early detection of cancer; early diagnosis; family practice; general practice; neoplasms.

### INTRODUCTION

The majority of patients with cancer begin their diagnostic process in general practice.<sup>1,2</sup> To improve the cancer diagnostic process, it is important to understand how the thought of cancer arises in a GP's mind.<sup>3,4</sup> Diagnostic strategies vary, but initial hypotheses often occur early and may be triggered by symptom presentation.<sup>5</sup> A 'critical style' with awareness of detail in ambiguous complaints may help a GP to arrive at a correct conclusion when a malignancy is present.<sup>6</sup>

This study investigated the relationship between symptoms presented in general practice and cancer, including the GP's suspicion of cancer being present. In a previous article the frequency of 'alarm symptoms' or warning signs of cancer and the relationship between symptoms and cancer were reported.<sup>7</sup> Historically, different symptoms have been promoted by cancer organisations and charities to encourage early consultations and, thus, early diagnoses; the symptoms studied are commonly associated with cancer in many countries. In this study, the frequency of warning signs of cancer were present 12.4% of patients who consulted their GP and in 40% of patients who were subsequently diagnosed as having cancer. The warning signs of cancer were valid in relation to a diagnosis of cancer but had a low positive predictive value as single symptoms.

Few studies deal directly with cancer suspicion. The qualitative study by Johansen *et al*<sup>4</sup> showed that practising

basic knowledge based on explicit rules and skills (such as alarm symptoms and clinical know-how) is only one important factor among others that makes the thought of cancer arise in a GP consultation. This article describes:

- how GPs assess warning signs of cancer and other factors as possible signs of cancer;
- what actions were taken by GPs; and
- to what extent a cancer suspicion proved to be correct.

### METHOD

The methods of this study will be outlined here in brief but have been described in more detail elsewhere.<sup>7</sup>

#### Study design and setting

A simple and well-established audit-type questionnaire (Appendix 1; available from the authors)<sup>7</sup> was sent to all the registered GPs in Norway in April 2006 ( $n = 3910$ ). A total of 396 (10.1%) GPs participated in the study; after exclusions, 51 073 patients were included in the study population. Some 6–7 months later a new questionnaire was sent to the GPs; 283 (71.5%) completed this, of whom 156 reported cancer diagnosis in a total of 261 patients.

#### Questionnaires

The initial questionnaire was sent to GPs, together with two pages of instructions and examples of how to complete the form.

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### How this fits in

Few studies explore what makes a GP suspect cancer during a consultation. This study confirmed the importance of selected symptoms, and of multiple symptoms. GPs may have confidence in their ability to suspect cancer and should explore cues given by symptoms and patient characteristics. Increased awareness of comorbidity and multiple consultations could increase the proportion of correct cancer suspicion.

GPs were instructed to register all patients who presented to them over a period of 10 working days. Birth date and sex were requested for every consultation and, if the patients had one or more warning signs of cancer, the GPs were to complete the remaining questions, including choosing between 'cancer possible, follow-up needed' or 'cancer not likely'. In the instructions, this was specified as a choice between two options: cancer was a possibility that should be pursued, or cancer seemed unlikely based on the GP's evaluation.

The warning signs of cancer were divided into seven focal symptoms and three general symptoms; these are listed in Table 1. The remaining questions dealt with:

- previous cancer,
- important comorbidity,
- whether this was a first or subsequent consultation,
- duration of symptoms, and
- actions taken: supplementary laboratory tests, imaging, and/or referrals.

The follow-up questionnaire was sent to GPs 6–7 months later. The GP was asked to:

- find, in the electronic database, all patients with a cancer that had been diagnosed after the initial registration, and
- complete an anonymous five-page questionnaire about diagnosis and treatment for each patient diagnosed with cancer.

This questionnaire was a modified version of a cancer care questionnaire used in a previous study after testing in several countries and being reliability tested in Norway.<sup>2</sup>

Variables used in this article were found in the initial questionnaire; the confirmed cancer diagnosis is the only information from the follow-up questionnaire used here.

### Analysis of data

The data were analysed using SPSS (version

**Table 1. GPs' suspicion of cancer when a patient presents with warning signs of cancer, by cancer diagnosis and non-diagnosis (n = 6321)**

Symptom	All warning signs of cancer				Cancer possible, needs follow-up		Cancer not likely		Missing registration of suspicion	
	n, all	n, cancer <sup>a</sup>	PPV	%, all cancers	n, all (%)	n, cancer <sup>a</sup> (%)	n, all (%)	n, cancer <sup>a</sup> (%)	n, all (%)	n, cancer <sup>a</sup> (%)
<b>Focal symptom</b>										
Non-healing skin lesion	309	5	1.6	4.7	105 (34.0)	3 (60.0)	149 (48.2)	1 (20.0)	55 (17.8)	1 (20.0)
Lump/nodule	918	12	1.3	11.3	202 (22.0)	4 (33.3)	611 (66.6)	4 (33.3)	105 (11.4)	4 (33.3)
Unusual bleeding	509	17	3.3	16.0	197 (38.7)	12 (70.6)	255 (50.1)	3 (17.6)	57 (11.2)	2 (11.8)
Pigmented skin lesion (mole)	518	4	0.8	3.8	101 (19.5)	3 (75.0)	356 (68.7)	1 (25.0)	61 (11.8)	0 (0.0)
Persistent digestive problem	1042	28	2.7	26.4	321 (30.8)	19 (67.9)	586 (56.2)	4 (14.3)	135 (13.0)	5 (17.9)
Cough/hoarseness of uncertain origin	774	15	1.9	14.2	158 (20.4)	7 (46.7)	497 (64.2)	5 (33.3)	119 (15.4)	3 (20.0)
Other symptom suspicious of cancer	879	22	2.5	20.84	343 (39.0)	15 (68.2)	321 (36.5)	1 (4.5)	215 (24.5)	6 (27.3)
One or more of the focal symptoms	4726	92	1.9	86.8	1307 (27.7)	55 (59.8)	2704 (57.2)	17 (18.5)	715 (15.1)	20 (21.7)
<b>General symptom</b>										
Unintentional weight loss	339	13	3.8	12.3	162 (47.8)	9 (69.2)	114 (33.6)	2 (15.4)	63 (18.6)	2 (15.4)
Unusual fatigue	1152	21	1.8	19.8	254 (22.0)	13 (61.9)	715 (62.1)	3 (14.3)	183 (15.9)	5 (23.84)
Unusual pain	1264	16	1.3	15.1	271 (21.4)	6 (37.5)	835 (66.1)	6 (37.5)	158 (12.5)	4 (25.0)
One or more of the general symptoms	2497	40	1.6	37.7	585 (23.4)	22 (55.0)	1561 (62.5)	10 (25.0)	351 (14.1)	8 (20.0)
<b>All symptoms</b>										
One or more of all warning signs	6321	106	1.7	100	1515 (24.0)	58 (54.7)	3854 (61.0)	24 (22.6)	952 (15.1)	24 (22.6)
<b>Multiple symptoms</b>										
2 symptoms	955	21	2.2	19.8	359 (37.6)	13 (61.9)	477 (49.9)	6 (28.6)	119 (12.5)	2 (9.5)
≥3 symptoms	193	12	6.3	11.3	109 (56.8)	10 (83.3)	51 (26.6)	0 (0.0)	33 (17.1)	2 (16.7)

<sup>a</sup> Number of patients with subsequent cancer. PPV = positive predictive value of symptom in relation to cancer.

19). The association between the symptoms and the GP's suspicion of cancer was examined using the  $\chi^2$  test and a logistic regression model, thereby comparing each symptom with all other symptoms. Possible interaction effects were tested by including product terms for each pair of symptoms in the logistic regression model.

The analysis revealed significant two-way interaction effects between several of the symptoms. A symptom would change a suspicion of cancer by varying degrees when combined with other symptoms. In order to avoid this effect of interaction on the odds ratios (ORs), calculations for single symptoms were limited to patients for whom only one symptom had been recorded (82% of patients). ORs for each symptom were adjusted for age and sex

only, and not for other symptoms.

As not all GPs recorded a suspicion of cancer, a sensitivity analysis was performed for the two extreme cases: that all missing cases had been recorded as either 'cancer possible, follow-up needed' or as 'cancer not likely'. Combinations that occurred frequently were examined separately in the group of patients with the same number of recordings, that is two symptom recordings for twin symptoms and three for 'triplets'. A  $\chi^2$  test was also used to relate cancer suspicion and subsequent cancer diagnosis to prior cancer, comorbidity, first or not-first consultation, duration of symptoms, and subsequent action by the GP.

Differences between means were compared using the Mann-Whitney U-test. The level of statistical significance was  $P < 0.05$ . Positive predictive values (PPVs) for symptoms in relation to cancer were calculated using the following formula:<sup>8</sup>

*Number of patients who had presented with warning sign(s) of cancer and were diagnosed with cancer*

*All patients with that warning sign of cancer*

**Table 2. Logistic regression model showing the association between warning signs of cancer and GPs' suspicion of cancer by single symptoms and the most common symptom combinations, each adjusted for age and sex**

	n	OR for suspicion	95% CI	P-value	Sensitivity analysis	
					Missing = possible	Missing = not likely
Age (increasing)		1.0	1.03 to 1.04	<0.001		
Sex (females = 1, males = 2)		1.3	1.1 to 1.5	<0.001		
Skin lesion	247	1.6	1.2 to 2.2	0.003	1.5	1.5
Lump	783	1.0	0.8 to 1.2	n.s.	0.9	1.1
Bleeding	406	2.4	1.9 to 3.0	<0.001	1.7	2.4
Mole	480	1.1	0.8 to 1.4	n.s.	1.0	1.1
Digestive problem	622	1.1	0.9 to 1.3	n.s.	1.0	1.1
Cough	612	0.5	0.4 to 0.7	<0.001	0.7	0.5
Weight loss	90	1.7	1.0 to 2.7	0.040	1.5	1.5
Fatigue	662	0.4	0.3 to 0.5	<0.001	0.7	0.4
Pain	712	0.4	0.3 to 0.5	<0.001	0.5	0.4
<b>Two warning signs of cancer</b>						
Lump and fatigue	24	0.8	0.3 to 2.4	n.s.	1.0	0.6
Lump and pain	36	0.6	0.3 to 1.3	n.s.	0.6	0.7
Bleeding and digestive problem	21	2.0	0.8 to 5.2	n.s.	1.6	2.3
Bleeding and fatigue	18	6.5	1.7 to 24.7	0.006	6.0	2.8
Bleeding and pain	19	1.9	0.7 to 5.2	n.s.	1.6	1.7
Digestive problem and weight loss	71	1.6	0.9 to 2.7	n.s.	1.3	1.7
Digestive problem and fatigue	57	0.8	0.4 to 1.4	n.s.	0.7	0.9
Digestive problem and pain	147	0.7	0.5 to 1.1	n.s.	0.7	0.8
Cough and weight loss	12	2.8	0.6 to 13.4	n.s.	2.6	2.0
Cough and fatigue	67	0.8	0.4 to 1.3	n.s.	0.8	0.9
Cough and pain	18	1.8	0.9 to 5.0	n.s.	1.5	2.1
Weight loss and fatigue	34	1.2	0.5 to 2.7	n.s.	1.5	0.8
Fatigue and pain	68	0.4	0.2 to 0.7	0.003	0.4	0.4
<b>Three warning signs of cancer</b>						
Digestive problem, weight loss, and fatigue	29	2.8	0.8 to 10.0	n.s.	3.2	1.0
Digestive problem, fatigue, and pain	22	0.3	0.1 to 0.8	0.016	0.6	0.4

6321 patients with warning signs of cancer (one recorded symptom, n = 5173; two symptoms, n = 955; three symptoms, n = 161; ≥4 symptoms, n = 32). OR = odds ratio. n.s. = non-significant.

## RESULTS

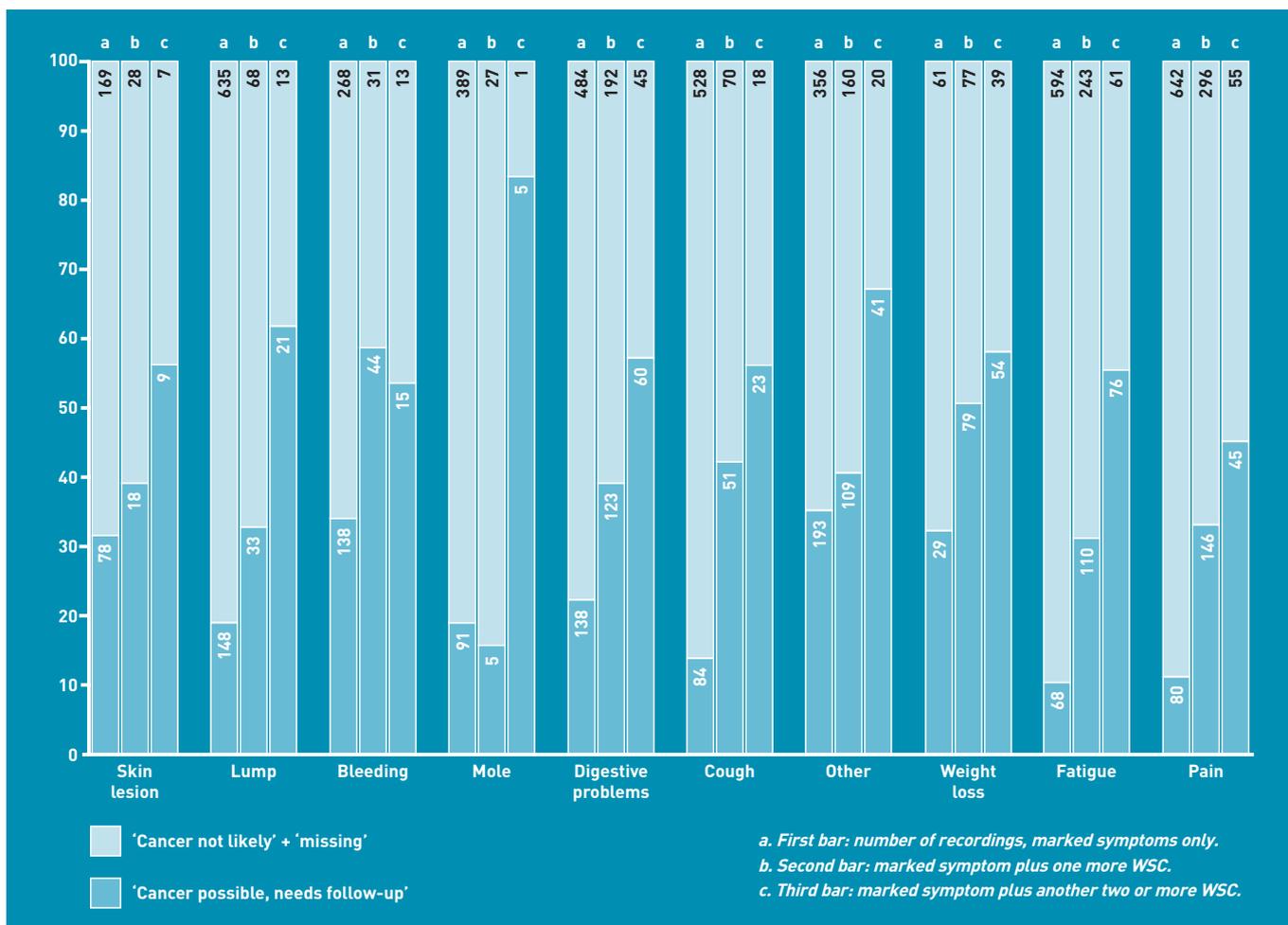
### Cancer suspicion based on warning signs of cancer

Among the 51 073 patients studied, one or more warning signs of cancer were registered in 6321 (12.4%) patients. The average age of patients was 54 years; 2386 were male and 3935 were female. In total, 261 patients had cancer at the time of follow-up, of whom 106 (40%) had one or more warning signs of cancer. The GPs assessed the possibility of cancer in 85% of the patients who presented with warning signs; 1515 (24.0%) were assessed as 'cancer possible, follow-up needed', while 3854 (61.0%) were assessed as 'cancer not likely' (Table 1). Overall, 3.8% of the positive suspicions proved correct and 0.6% of patients were diagnosed as having cancer in spite of a 'cancer not likely' recording; as such, a cancer suspicion that proved to be correct was six times more likely to occur than an erroneous lack of suspicion.

The patients who were diagnosed with cancer and had presented to their GP with warning signs had a mean age of 70 years (range 51–91 years). PPV for being diagnosed with cancer after having presented with one or more warning signs was 1.7% (Table 1).

On average, patients with warning signs of cancer had 1.4 warning signs each when

**Figure 1. Cancer suspicion by number of GP-recorded warning signs of cancer (WSC).**



there was a subsequent diagnosis of cancer and 1.2 warning signs each when there was no such subsequent diagnosis ( $P < 0.001$ ). Of the 106 patients diagnosed with cancer who presented with warning signs, cancer was suspected in 58 (54.7%) and not suspected in 24 (22.6%); on average, 1.6 and 1.3 warning signs of cancer were evident per patient, respectively. In the remaining 24 patients the GPs did not record whether or not they suspected cancer.

The suspicion rate was higher for males than females (27% versus 22% [ $P < 0.001$ ]) and increased with age (Table 2). Suspicion rates varied with different symptoms. Digestive problem was the most common focal symptom, no matter whether cancer was or was not diagnosed; this symptom caused GPs to suspect the presence of cancer in 31% of the patients who presented with it (Table 1). In patients with cancer, GPs suspected cancer in around 70% of the patients who initially presented with bleeding, digestive problem, and weight loss, and also in the few cancer patients who had a recording of a mole. They

suspected cancer in around 60% of patients with a recording of fatigue or skin lesion. Cancer was suspected less frequently in patients presenting with lump, cough, and pain (Table 1).

When symptoms were compared one by one with all other symptoms, skin lesion (OR = 1.6), bleeding (OR = 2.4), and weight loss (OR = 1.7) showed significant association with cancer suspicion, while cough (OR = 0.5), fatigue (OR = 0.4), and pain (OR = 0.4) showed a negative association with suspicion (Table 2). In the sensitivity analysis with the elimination of missing cases, the ORs showed minor variation up or down, but did not have an effect on the conclusions drawn (Table 2).

### Multiple symptoms

Multiple symptoms were reported in 1148 (18%) of the patients who presented with warning signs of cancer, and 193 of these had three or more symptoms. Cancer suspicions rose with an increasing number of warning signs (Table 1, Figure 1). In addition, cancer incidence increased.

**Table 3. Factors related to cancer being diagnosed or not, or suspected or not (*n* = 6321)<sup>a</sup>**

	All patients with warning sign(s) of cancer				Cancer possible, needs follow-up		Cancer not likely		Missing registration	
	<i>n</i>	<i>n</i> , cancer <sup>b</sup>	PPV	% of all cancers	<i>n</i> (%)	<i>n</i> , cancer <sup>b</sup> (%)	<i>n</i> (%)	<i>n</i> , cancer <sup>b</sup> (%)	<i>n</i> (%)	<i>n</i> , cancer <sup>b</sup> (%)
Previous cancer	610	38	6.2	35.8	216 (35.4)	19 (50.0)	127 (20.8)	3 (7.9)	267 (43.8)	16 (42.1)
Comorbidity	651	21	3.2	19.8	170 (26.1)	10 (47.6)	346 (53.1)	6 (28.6)	135 (20.7)	5 (23.8)
First consultation	2847	36	1.3	34.0	747 (26.2)	22 (61.1)	1840 (64.6)	11 (30.6)	260 (9.1)	3 (8.3)
Not first consultation	2553	60	2.4	56.6	640 (25.1)	33 (55.0)	1458 (57.7)	12 (20.0)	455 (17.8)	15 (25.0)
<b>Duration of symptoms, weeks</b>										
0–1	535	8	1.5	7.5	113 (21.1)	4 (50.0)	366 (68.4)	3 (37.5)	55 (10.3)	1 (12.5)
2–7	1283	19	1.5	17.9	359 (28.0)	16 (84.2)	795 (62.0)	3 (15.8)	129 (10.1)	0 (0)
8–23	1320	25	1.9	23.6	426 (32.3)	18 (72.0)	775 (58.7)	4 (16.0)	116 (8.8)	3 (12.0)
24–51	491	10	2.0	9.4	140 (28.5)	6 (60.0)	288 (58.7)	2 (20.0)	61 (12.4)	2 (20.0)
≥52	785	13	1.7	12.3	148 (18.9)	5 (38.5)	524 (66.8)	2 (15.4)	107 (13.6)	6 (46.2)
<b>Supplementary actions</b>										
Laboratory tests	2719	52	1.9	49.1	838 (30.8)	33 (63.5)	1569 (57.7)	12 (23.1)	312 (11.5)	7 (13.5)
Imaging	1140	33	2.9	31.1	461 (40.4)	20 (60.6)	561 (49.2)	7 (21.2)	118 (10.4)	6 (18.2)
Referrals	1342	41	3.1	38.7	555 (41.4)	30 (73.2)	614 (45.8)	4 (9.8)	173 (12.9)	7 (17.1)
0 action	2370	24	1.0	22.6	249 (10.5)	5 (20.8)	1644 (69.4)	8 (33.3)	466 (19.7)	11 (45.8)
1 action	2847	42	1.5	39.6	758 (26.6)	25 (59.5)	1729 (60.7)	10 (23.8)	353 (12.4)	7 (16.7)
2 actions	958	36	3.8	34.0	428 (44.7)	26 (72.2)	428 (44.7)	5 (13.9)	97 (10.1)	5 (13.9)
3 actions	146	4	2.7	3.84	80 (54.8)	2 (50.0)	53 (36.3)	1 (25.0)	12 (8.2)	1 (25.0)

<sup>a</sup>Patients presenting with warning signs of cancer, of whom 106 got cancer. <sup>b</sup>Number of patients with subsequent cancer. PPV = positive predictive value in relation to cancer.

When the GP had a cancer suspicion, 13 of 359 (3.6%) patients with two registered symptoms and 10 of 109 (9.2%) with three symptoms had the suspicion confirmed. Where cancer was not suspected, six of 477 (1.3%) patients with two symptoms and no patients with three symptoms turned out to have cancer (Table 1).

Bleeding and fatigue (OR = 6.5) showed a positive association with cancer suspicion compared with all other double combinations. Fatigue and pain (OR = 0.4) and digestive problem, fatigue, and pain (OR = 0.3) similarly showed a negative association (Table 2).

The number of cancer cases encountered for each combination of symptoms was low (*n* = 0–2 in most cases), but for 71 patients with digestive problem and weight loss (OR = 1.6) there were six cases of cancer and five of these were suspected by the GP.

Digestive problem was the most common focal symptom; it occurred in 420 patients with multiple symptoms (36.6% of all combinations, most often with one or more general symptoms). Weight loss was unique in that it was the only warning sign that occurred more often in combinations than as a single symptom, and all cancer cases where the patient had presented with weight loss had multiple warning signs of cancer.<sup>7</sup> In spite of this, weight loss as a single symptom resulted in a suspicion of cancer three times as often as the two other general symptoms.

Cancer suspicion based on single symptoms occurred in 10–35% of warning signs of cancer registrations, while suspicion rates based on two symptoms, or on three or more symptoms, ranged from 16% to 59% and from 45% to 83%, respectively (Figure 1).

#### Other factors influencing cancer suspicion

Data discussed here are presented in Table 3. Previous cancer was registered in 610 patients with warning signs of cancer; in 35.4% of these patients cancer was suspected, while in 20.8% of them it was not. Cancer occurred in 38 (6.2%) of these people, and 26 of them had a relapse. A previous cancer diagnosis was the only non-symptom variable for which the percentage of a positive cancer suspicion was higher than that for the non-suspicion of cancer. Of the patients with cancer who had previously had cancer, 50.0% were registered as 'cancer possible, follow-up needed' while for 7.9% the GP did not suspect that the symptoms were caused by cancer.

Important comorbidity did not seem to increase the GPs' suspicion of cancer, noted for 26% of all patients with comorbidity. Of 651 patients with comorbidity, 3.2% were later diagnosed with cancer; 19.8% of the patients with cancer and warning signs of cancer had important comorbidity.

Compared with the first consultation, the

proportion of cancer cases almost doubled with two or more consultations; this did not appear to influence the GPs' judgement, with almost the same proportion of patients suspected of having cancer in the two groups.

The duration of warning signs of cancer was registered for 4414 or around [70%] patients. The same percentage applied for the patients with cancer. Median duration before presenting to the GP was 10 weeks. There was no sex difference. A duration of 2–23 weeks was noted for 59% of all patients for whom duration of symptoms was recorded, whether or not they were later diagnosed with cancer. Suspicion did not vary greatly between duration intervals.

#### **GPs' actions**

The GPs' actions markedly increased when cancer was suspected. In 54.8% of the cases when a GP suspected cancer, they initiated laboratory testing, as well as referrals to diagnostic imaging and referrals to a hospital and/or specialist; in 10.5% of cases, none of these were requested. In comparison, for 69.4% of the group in whom cancer was not suspected, none of these actions were requested; for 36.3% all three kinds of actions were undertaken. When cancer was suspected, the GP tended to request imaging or referral relatively more frequently than laboratory tests (Table 3).

## **DISCUSSION**

### **Summary**

Warning signs of cancer vary in their tendency to make GPs suspect cancer. All warning signs of cancer are valid symptoms of the disease,<sup>7</sup> but symptoms such as cough and pain may be more easily connected with benign diagnoses in a GP's daily practice. When the number of symptoms increased in a patient, cancer suspicion also increased. One-quarter of all patients with warning signs of cancer and more than half of those diagnosed with cancer who presented to the GP with warning signs were suspected of having cancer. Not all cancer suspicions proved correct, but cancer was six times more likely to be diagnosed when it was suspected than when it was not.

For a single symptom like weight loss, which, in itself, raised a high degree of suspicion, there was no corresponding cancer case. Only when weight loss occurred in combination with other symptoms were some of the suspicions confirmed. Cough seemed to be underestimated as a symptom that aroused suspicion. The combination of digestive problem and

weight loss warning signs had an OR of 1.6, which was not significant in relation to cancer suspicion, but GPs recorded cancer suspicion in five of six cancer cases. Overall, the GPs seemed to have a reason both for their recordings of suspicion and for their lack of suspicion; much higher ORs, both for single warning signs of cancer and for combinations, should not be expected.

One in three patients diagnosed with cancer who had presented with a warning sign had had a previous cancer; GPs seemed to be aware of the importance of this. Comorbidity did not trigger the GPs' suspicion to the same extent, even though the cancer incidence almost doubled when the patient had presented both warning signs of cancer and important comorbidity. Both previous cancer and important comorbidity should increase a GP's awareness of cancer; for patients with a history of cancer, this is especially so with regard to the possibility of recurrence of the same cancer type.

Cancer cases also doubled when the patient came for a second or subsequent consultation. This may signal an important message to GPs because the degree of cancer suspicion was the same for first and for later consultations.

The duration of symptoms did not seem to greatly influence GPs' suspicion of cancer or the reality of it being present.

As expected, the number of actions taken by GPs increased in line with cancer suspicion however, in spite of this, more than 10% of GPs carried out no laboratory tests, diagnostic imaging, or referrals even though they suspected cancer. In another Norwegian study most patients where there was a suspicion of cancer were given new appointments in general practice.<sup>9</sup>

### **Strengths and limitations**

The prospective recording of cancer eliminated knowledge about the diagnosis at the time of symptom recording. The GP's judgement about the likelihood of cancer was missing in 15% of patients with one or more warning signs of cancer, 24 [23%] of whom had cancer. This may have introduced some bias in the balance between 'cancer possible' and 'cancer not likely'; however, because the missing data are distributed between all warning signs of cancer and GPs deal with uncertainty in different ways, it is not thought that the bias is systematic. The results did not change greatly in the sensitivity analyses where values were assigned to the missing data.

To avoid interaction effects on the estimated ORs, analysis for each single

symptom was limited to 82% of the patient material. OR estimates for multiple symptoms have wide confidence intervals because of fewer patients. Any study asking GPs to consider the possibility of cancer during a consultation may tend to raise their consciousness of the disease, possibly increasing the proportion of 'cancer possible' answers; however, it may also make GPs more critical in their assessments.

The interval between initial recordings and the registration of cancer was chosen to increase the possibility that a symptom would have relevance for any cancer that was not yet diagnosed. In some cases, the consultation may have taken place before cancer could have been suspected; the fact that 55% of the 106 patients who presented with warning signs of cancer and then developed cancer were suspected of having cancer reflects only a cross-sectional view at a certain point in time before diagnosis. Some of the cancer that had not been suspected may have had recordings of non-cancer symptoms only.

Some other considerations concerning GP participation and double recordings of patients are discussed in Ingebrigtsen *et al*;<sup>7</sup> however, these are not considered relevant to the results presented here. In order to limit the workload for the GP, they were not asked to record suspicions of cancer if there were no warning signs. As a result of this, there are no such data for the 156 patients who were diagnosed with cancer but showed no warning signs.

#### Comparison with existing literature

Symptoms and the other factors studied are not the only things to influence GPs' suspicions of cancer. Cognitive factors have been shown to be important,<sup>10,11</sup> as is interpersonal awareness; that is, being alert to changes in the patients' appearance or behaviour, and to cues they give,<sup>4</sup> however, this was not intended to be part of the study.

There is current interest in the physician's gut feeling<sup>12</sup> based on the hypothesis that analytical and non-analytical processes interact during the doctor's diagnostic work.<sup>13</sup> However, gut feeling sometimes may be based on clinical observations rather than vague impressions, that is, general appearance, breathing pattern, and weight loss.<sup>14</sup> It is an open question whether first impressions inspire measurements and closer clinical examination, thereby leading to more comprehensive referrals by GPs.

The Cancer Prediction in Exeter (CAPER) studies have provided evidence that alarm

symptoms are important, but also that, for cancers like colorectal and lung cancer, most patients will experience lower-risk symptoms rather than the more obvious 'red flags' represented by rectal bleeding and haemoptysis.<sup>15</sup> Most GPs are aware of this, and it is rational not to suspect cancer every time a patient presents with a warning sign of cancer. The role of symptoms has also been confirmed in a recent British study investigating the journey of the patient with cancer.<sup>16</sup> This, together with the finding that patients (especially older people) are commonly diagnosed through emergency presentation<sup>17</sup> may support the finding that comorbidity confounds the GP's thinking and leads to an underestimation of the role of symptoms in older patients. Consistent with Nylenna<sup>18</sup> this current study found that tests had been taken from about half of patients in whom cancer was suspected, and the referral rate was similar.

Because the PPV for cancer will always be low for single symptoms, further information gained through the medical history, clinical examination, and supplementary tests is important for diagnostic thinking.<sup>7</sup> Kostopoulou *et al*<sup>19</sup> found that physicians tended to distort incoming medical information to support an emerging diagnosis — and more so when the physician was less experienced. If comorbidity is present, one condition may mask another so that a second morbidity is not suspected.<sup>20</sup> Jiwa *et al*<sup>21</sup> found that coexisting multiple pathologies could increase diagnostic delay.

In this study, more than half of the patients with cancer had paid more than one visit to the GP. Lyratzopoulos *et al*<sup>22,23</sup> found that many patients with cancer have several primary care visits before getting a diagnosis of cancer, but that 82% were referred after the first or second consultation; this varied for different types of cancer. Hansen *et al*<sup>24</sup> found that 3 weeks was the median patient delay. Symptoms in this current study had a median duration of 10 weeks but, for half of the patients, this was not a first consultation, which contributes to a longer symptom interval.

#### Implications for research and practice

The GP succeeded in suspecting cancer in more than half of the patients with cancer and correct suspicions were six times more likely to occur than erroneous lack of suspicion. In view of the cross-sectional design, in which most patients had a single consultation where suspicion could arise, the study believes this shows that GPs are attentive to the possibility of cancer.

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#### Ethical approval

The survey protocol was accepted by the Norwegian Data Inspectorate and ethical approval for the project was given by the Regional Committee for Medical and Health Research Ethics of Northern Norway (P Rek Nord 44/2005). No patients were contacted and personal data that were recorded were limited to sex, year of birth, and type of cancer. Only the individual GP knew the identity of any single patient.

#### Provenance

Freely submitted; externally peer reviewed.

#### Competing interests

The authors have declared no competing interests.

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Some asymptomatic cancers are discovered through screening or otherwise, or with an acute presentation, meaning that GPs can never suspect 100% of cases. Multiple symptoms, previous cancer, and advancing age increased both cancer suspicion and cancer incidence. This study shows that comorbidity and more than one consultation for the same symptom should also cause a GP to suspect cancer. Symptoms that remain unclear at the end of a GP consultation may, at least, merit a follow-up appointment; perhaps this is particularly true for cough, fatigue or pain.

Overall, the quantification of relevant symptoms and other risk factors should help GPs to balance the awareness and

suspicion of cancer and enhance the early diagnostic process. More studies connecting symptoms with specific forms of cancer are needed, and ideally, they should have a prospective design. Research exploring the concept of gut feeling may prove useful, both for emergency situations and in routine consultations where the low prevalence of serious disease is a challenge.<sup>25</sup> In recent years, qualitative studies have added to the understanding of delay in diagnosing cancer, the factors in the patient–doctor relationship that are important for cancer awareness during a consultation, and how it affects diagnostic reasoning. Further studies should be encouraged.

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