

# BMJ Open Identifying important health system factors that influence primary care practitioners' referrals for cancer suspicion: a European cross-sectional survey

Michael Harris,<sup>1,2</sup> Peter Vedsted,<sup>3</sup> Magdalena Esteva,<sup>4</sup> Peter Murchie,<sup>5</sup> Isabelle Aubin-Auger,<sup>6</sup> Joseph Azuri,<sup>7</sup> Mette Brekke,<sup>8</sup> Krzysztof Buczkowski,<sup>9</sup> Nicola Buono,<sup>10</sup> Emiliana Costiug,<sup>11</sup> Geert-Jan Dinant,<sup>12</sup> Gergana Foreva,<sup>13</sup> Svjetlana Gašparović Babić,<sup>14</sup> Robert Hoffman,<sup>7</sup> Eva Jakob,<sup>15</sup> Tuomas H Koskela,<sup>16</sup> Mercè Marzo-Castillejo,<sup>17</sup> Ana Luísa Neves,<sup>18,19</sup> Davorina Petek,<sup>20</sup> Marija Petek Ster,<sup>20</sup> Jolanta Sawicka-Powierza,<sup>21</sup> Antonius Schneider,<sup>22</sup> Emmanouil Smyrnakis,<sup>23</sup> Sven Streit,<sup>2</sup> Hans Thulesius,<sup>24</sup> Birgitta Weltermann,<sup>25</sup> Gordon Taylor<sup>1</sup>

**To cite:** Harris M, Vedsted P, Esteva M, *et al.* Identifying important health system factors that influence primary care practitioners' referrals for cancer suspicion: a European cross-sectional survey. *BMJ Open* 2018;**8**:e022904. doi:10.1136/bmjopen-2018-022904

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2018-022904>).

Received 14 March 2018  
Revised 9 June 2018  
Accepted 16 July 2018



© Author(s) (or their employer(s)) 2018. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

## Correspondence to

Professor Michael Harris;  
michaelharris681@btinternet.com

## ABSTRACT

**Objectives** Cancer survival and stage of disease at diagnosis and treatment vary widely across Europe. These differences may be partly due to variations in access to investigations and specialists. However, evidence to explain how different national health systems influence primary care practitioners' (PCPs') referral decisions is lacking. This study analyses health system factors potentially influencing PCPs' referral decision-making when consulting with patients who may have cancer, and how these vary between European countries.

**Design** Based on a content-validity consensus, a list of 45 items relating to a PCP's decisions to refer patients with potential cancer symptoms for further investigation was reduced to 20 items. An online questionnaire with the 20 items was answered by PCPs on a five-point Likert scale, indicating how much each item affected their own decision-making in patients that could have cancer. An exploratory factor analysis identified the factors underlying PCPs' referral decision-making.

**Setting** A primary care study; 25 participating centres in 20 European countries.

**Participants** 1830 PCPs completed the survey. The median response rate for participating centres was 20.7%.

**Outcome measures** The factors derived from items related to PCPs' referral decision-making. Mean factor scores were produced for each country, allowing comparisons.

**Results** Factor analysis identified five underlying factors: PCPs' ability to refer; degree of direct patient access to secondary care; PCPs' perceptions of being under pressure; expectations of PCPs' role; and extent to which PCPs believe that quality comes before cost in their health systems. These accounted for 47.4% of the observed variance between individual responses.

## Strengths and limitations of this study

- The questionnaire was developed using content validity reduction and factor analysis of a consensus item pool, and therefore grounded in primary care practitioners' (PCPs') clinical experience.
- PCPs were recruited from 20 European countries, 4 countries from each of the Central, Eastern, Northern, Southern and Western European geographical areas.
- Most samples were taken from each local lead's own locality, and these may not have been representative of their nations as a whole.
- The response rate was low but comparable to that of other equivalent surveys of primary care doctors.

**Conclusions** Five healthcare system factors influencing PCPs' referral decision-making in 20 European countries were identified. The factors varied considerably between European countries. Knowledge of these factors could assist development of health service policies to produce better cancer outcomes, and inform future research to compare national cancer diagnostic pathways and outcomes.

## BACKGROUND

There is wide variation in cancer survival rates across Europe.<sup>1</sup> Data from the fifth cycle of the European Cancer Registry-based Study on Survival and Care of Cancer Patients (EUROCARE-5) show that the 1-year relative survival rate for all cancer sites varies from 58.2% to 81.1% between countries<sup>1</sup>

**Table 1** EUROCARE-5 1-year relative and 5|1-year conditional cancer survival rates for European countries,<sup>1</sup> with ranks given

Country	1-year relative survival (%)	1-year relative survival: rank	5 1-year conditional survival (%)	5 1-year conditional survival: rank
Austria	75.9	11	60.1	7
Belgium	78.9	3	60.4	6
Bulgaria	58.2	28	38.7	28
Croatia	62.1	25	46.2	22
Czech Republic	68.3	19	50.7	19
Denmark	69.8	18	50.9	18
Estonia	65.9	22	46.0	24
Finland	76.9	8	61.4	4
France	77.8	7	58.6	10
Germany	76.7	9	59.1	9
Greece	(not available)		(not available)	
Iceland	78.3	6	61.2	5
Ireland	70.3	16	54.0	15
Israel (Arabs)*	78.6	4	61.4	3
Israel (Jews)*	82.8	1	68.9	1
Italy	74.9	12	56.8	12
Latvia	60.9	27	41.7	26
Lithuania	63.8	24	46.1	23
Malta	70.0	17	52.9	16
Netherlands	73.0	14	54.6	14
Norway	76.1	10	58.6	11
Poland	61.7	26	40.6	27
Portugal	74.0	13	56.4	13
Romania	(not available)		(not available)	
Slovakia	65.4	23	44.8	25
Slovenia	67.7	21	47.8	21
Spain	71.5	15	52.8	17
Sweden	81.1	2	64.8	2
Switzerland	78.3	5	59.2	8
UK	67.9	20	50.1	20
European mean	72.5		54.2	

\*Calculated from data provided by B Silverman, Israel Ministry of Health (personal communication, 7 September 2017).

(table 1). Although 1-year relative survival can be affected by differences in registration (eg, completeness and use of death certificates), and lead-time and overdiagnosis biases,<sup>2 3</sup> it is generally taken to be an indicator of more advanced disease at diagnosis.<sup>4 5</sup> Survival differences in the subsequent 4-year period (known as '5|1-year conditional survival') are narrower, suggesting that earlier diagnosis could reduce the 1-year relative survival gap.<sup>6</sup> This is supported by increasing evidence that longer time to diagnosis and treatment may adversely affect mortality.<sup>7-13</sup> While recent overall cancer survival trends show improvements,<sup>14</sup> there is little narrowing in the between-country survival differences.<sup>15</sup>

The challenge of where and how to achieve more timely diagnosis is considerable.<sup>16</sup> A general practitioner (GP) will see only a small number of new cancers each year, for example, a GP in the United Kingdom (UK) will on average have a new cancer diagnosed in one of his or her patients each month.<sup>17</sup> The majority of cancers are identified because the patient has been experiencing symptoms. However, most patients present with evolving and undifferentiated symptoms that are much more likely to be interpreted as something other than cancer.<sup>16</sup>

GP gatekeeping, in which patients' access to specialists, hospital care and diagnostic tests needs to be authorised by GPs,<sup>18</sup> is the cornerstone of many European medical

systems.<sup>19</sup> There is evidence that stronger gatekeeper systems are linked with lower 1-year relative cancer survival than systems without such gatekeeper functions.<sup>20</sup> This may be because gatekeeping systems can impose cost and resource decisions which impede early referral for investigation.<sup>21</sup> However, there are wide variations in the degree of gatekeeping between countries, with no simple binary model as to whether or not a country has a ‘GP-as-gatekeeper’ system, and a European study found no link between a higher probability of initial consultation with a GP and poorer cancer survival.<sup>22</sup>

The way in which different healthcare systems support primary care in cancer diagnosis by quick and easy access to investigations may also be a factor in timeliness of cancer diagnosis.<sup>23</sup> It has been suggested that GPs need faster routes to diagnostic tests and/or specialist opinion for all patients with a suspicious symptom, above a certain threshold.<sup>21</sup> In the UK, use of an urgent cancer referral pathway has been found to be associated with reduced mortality<sup>24</sup> and a reduction in the proportion of cancers diagnosed through emergency presentations.<sup>25</sup> An International Cancer Benchmarking Partnership (ICBP) study demonstrated a correlation between the readiness of primary care practitioners (PCPs) to investigate suspicious symptoms and cancer survival rates.<sup>26</sup> No consistent associations were found between how likely practitioners were to investigate and PCP demographics, practice or health system variables. However, there was no exploration of how individual doctors felt that health system factors affected their decision-making.

The Örenäs Research Group is a European group of primary care researchers that studies the primary care factors that relate to cancer survival. It has identified a large variety of non-clinical factors that are likely to have a considerable impact on PCPs’ referral decision-making.<sup>27</sup> These include levels of gatekeeping responsibility, funding systems, access to investigations and relationships with specialist colleagues. However, there has been little research done to explain how these vary between countries.<sup>16</sup>

This study investigated the health system factors potentially influencing European PCPs’ decision-making with regard to investigating patients who may have cancer, and how these vary between European countries.

## METHODS AND DESIGN

### Design

We performed an international online survey of PCPs in 20 European countries between November 2015 and December 2016. Some of the methodology described here reproduces information already reported in our published protocol paper.<sup>28</sup>

### Development of the questionnaire

Following a literature review, 7 Örenäs Research Group investigators developed and agreed by consensus a list of 45 items, each relating to predefined aspects/concepts

that may affect a PCP’s decision to refer patients with potential cancer symptoms for further investigation. A questionnaire based on these items was piloted by 16 members of the Örenäs Research Group to assess content validity. Six of the items were removed due to low content validity. An English-language questionnaire with the remaining 39 items was piloted by 49 PCPs in 16 Örenäs Research Group member countries (table 2). Nineteen items were found to show little or no variation between countries and were removed from the questionnaire, leaving 20 items.

Örenäs Research Group leads arranged for translations of the questionnaire into their local languages where these were not English, a total of 19 translations from the original English. Translation and validation were done in a standardised way<sup>29</sup>: native speakers of the local languages who were fluent in English and were medically qualified did the ‘forward’ translations. ‘Backward’ translations into English were then made by translators who were fluent in both English and their local language. The forward translations were then compared with the backward ones, to assess semantic and conceptual equivalence.<sup>30</sup> Discrepancies between the forward and backward translations were resolved by discussion with the translators, following which the final translation was agreed on. Finally, in each country the corrected versions were piloted in a small sample of PCPs to evaluate the instructions, response format and the items for clarity and to ensure cultural adaptation.<sup>30</sup>

### The questionnaire and distribution

The final questionnaire sought demographic information (table 3) and presented the 20 health system factor items (listed in table 4). Respondents were asked to rate how much they agreed with each item in relation to their referral decision-making for patients who could have cancer. A five-point Likert rating scale was provided for participants, with response options ranging from ‘strongly disagree’ to ‘strongly agree’. The questionnaires were put online using SurveyMonkey. Online methodology was used to aid the logistics of survey administration; online surveys have been successfully used in research involving cancer care professionals.<sup>31</sup>

### Study population

The study was conducted in 25 Örenäs Research Group centres in 20 countries across Europe: Bulgaria, Croatia, Denmark, England, Finland, France, Germany, Greece, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Scotland, Slovenia, Spain, Sweden and Switzerland. Local study leads were asked to either gain ethical approval or obtain a statement that formal ethical approval was not needed in their jurisdiction (see online supplementary file).

Subjects were eligible for the survey if they were doctors working mainly in primary care. These doctors, here referred to collectively as ‘PCPs’, included GPs and other doctors who had had specialist training but worked in the

**Table 2** Results of questionnaire pilot

Response	Number of countries in which piloting PCPs agreed with statement	Number of countries in which piloting PCPs were unsure	Number of countries in which piloting PCPs disagreed with statement
Even if there are no 'red-flag' symptoms, we usually refer if we have a feeling that something is wrong.*	11	4	0
Here, high-quality care for an individual patient is always more important than costs.	5	6	5
If we have 'over-referred', our own income may be reduced.*	1	3	12
If we organise any investigations, we pay for that ourselves.*	1	2	13
In some practices, patients often have to travel a long way to see a specialist.	9	5	2
Long waiting lists for specialists or tests mean that we sometimes delay a referral/special investigation until it is really necessary.*	1	10	5
Many primary care doctors have special investigations (eg, diagnostic ultrasound) in their practices.*	1	5	10
Missing a diagnosis of cancer is something that we particularly worry about.*	15	0	0
Patients can self-refer to specialists, so we do not need to act as a gatekeeper.	5	1	10
Patients sometimes criticise us if they think we delayed a cancer diagnosis because of a late referral.*	13	3	0
Paying for a specialist can be a problem for some of our patients.	5	4	7
Referral costs are usually paid by insurance companies, not primary care or hospital budgets.	6	3	7
Referring or not referring does not affect our income at all.	10	3	3
Some of our referral systems (eg, online referral systems) make the referral process more difficult.*	1	4	11
Specialists often try to reduce referrals to them.*	1	5	10
Specialists often welcome referrals.	6	7	3
Specialists sometimes criticise us if they think that a cancer diagnosis was slow because of a late referral.*	12	3	1
Specialists sometimes criticise us if they think that we should have been able to look after the patient ourselves.	7	5	4
There is a special, quick specialist appointment system for patients with suspected cancer.	8	3	5
Usually, patients prefer a general practitioner (rather than a specialist) to look after them.	6	6	4
We are asked not to refer patients with a low risk of cancer.*	1	4	11
We are asked to refer any patients with possible cancer early, even if there is a low risk of cancer.	6	7	3
We are likely to refer if the patient is very worried that he/she has cancer, even if there are no 'red flag' symptoms.*	12	2	1
We are likely to refer if the patient says that she/he would like to be referred, even if there are no red flags.	8	3	4
We are often worried about the risk of unnecessary (and possibly harmful) investigations.*	12	2	1
We are under media (newspaper, television) or public pressure to refer earlier.	5	4	6
We are under media (newspaper, television) or public pressure to refer less.*	1	3	11

Continued

Table 2 Continued

Response	Number of countries in which piloting PCPs agreed with statement	Number of countries in which piloting PCPs were unsure	Number of countries in which piloting PCPs disagreed with statement
We are usually very busy, so we sometimes refer to help reduce our workload.	6	5	5
We can easily email a specialist for advice.	5	3	8
We can easily telephone a specialist for advice.	5	5	6
We can refer directly to a named specialist.	8	4	4
We have a budget for patient care costs, but we share it with secondary care.*	0	2	14
We have a budget or quota (maximum limit) for referrals.*	1	3	12
We have a budget or quota (maximum limit) for special tests.	4	2	9
We have guidelines that help us decide which patients to refer.	7	2	7
We often refer to a specialist that we know personally.	8	6	2
We usually have enough time in the consultation to think carefully about whether the patient needs a referral.	6	6	4
We worry about the possibility of legal action or a formal complaint if we refer late.*	8	7	1
Writing a good referral letter takes time, and as we are usually very busy we sometimes delay making a referral.*	1	2	13

\*These statements were removed from the final questionnaire because either (a) one or no piloting countries agreed with the statement, or (b) one or no piloting countries disagreed with the statement.

community and could be accessed directly by patients without referral.

### Sample size

A total sample size of 1000 or more responses was calculated to be sufficient to obtain stable factor estimates within the exploratory factor analysis,<sup>32</sup> based on each jurisdiction recruiting at least 50 respondents. This provided a 95% CI of at most  $\pm 14\%$ .

### Recruitment of participants

Each Örenäs Research Group local lead was asked to email an invitation to take part in the survey to the PCPs in their local health district, and to recruit at least 50 participants. In six countries (Denmark, Norway, Portugal, Romania, Slovenia, Sweden), the invitation was distributed to a national sample. Any local leads who had difficulty in achieving the required sample sizes were asked to increase the number of responses by using snowballing.<sup>33</sup> Consent was implied by agreeing to take part in the survey. All data were collected anonymously.

### Statistical analysis

The demographic characteristics of the respondents were explored using descriptive statistics. Likert scale responses were converted to numerical scores ('strongly disagree'=1, 'strongly agree'=5). An exploratory factor analysis was undertaken on these responses, to identify underlying factors and to test the predefined constructs.

We used a principal components method,<sup>34</sup> with a direct oblimin rotation to allow for correlated factors. The number of components was defined by inspection of the scree plot and the Kaiser criterion (eigenvalue  $\geq 1$ ). Between-country variation in these factors was then examined and presented as means with 95% CIs. We made a sensitivity analysis with weighting of the responses to adjust for the differing numbers of respondents per country. Calculations were performed using IBM SPSS V.22.

### Patient and public involvement

There was no patient or public involvement in this study.

## RESULTS

A total of 1830 PCPs completed the questionnaire. All participating centres received at least 50 responses, with a median of 72 respondents per centre. PCPs' demographic distributions are shown in table 3. The median response rate per country was 20.8% (range 6.7%–57.8%).

The mean national Likert-scale values for each of the 20 questions are given in table 4.

The factor loadings for each of the 20 items are shown in table 5. The factor analysis identified five factors which accounted for 47.4% of the variance of individual responses. The factor means for each participating country and their 95% CIs are given in table 6.

**Table 3** Number of respondents per country and demographic distributions.

Country	Number of respondents (% of all respondents)
Bulgaria	51 (2.8)
Croatia	56 (3.1)
Denmark	92 (5.0)
England	62 (3.4)
Finland	61 (3.3)
France	52 (2.8)
Germany	91 (5.0)
Greece	59 (3.2)
Israel	58 (3.2)
Italy	60 (3.3)
Netherlands	107 (5.8)
Norway	81 (4.4)
Poland	135 (7.4)
Portugal	59 (3.2)
Romania	146 (8.0)
Scotland	62 (3.4)
Slovenia	91 (5.0)
Spain	379 (20.7)
Sweden	68 (3.7)
Switzerland	60 (3.3)
Total	1830 (100)
Respondent gender	
Female	1108 (60.5)
Male	708 (38.7)
Not stated	14 (0.8)
Total	1830 (100)
Years since graduation	
<10	284 (15.5)
10–19	492 (26.9)
20–29	535 (29.2)
30–39	442 (24.2)
40 or over	69 (3.8)
Not stated	8 (0.4)
Total	1830 (100)
Site of practice	
Urban	1086 (59.6)
Rural	426 (23.3)
Island	50 (2.7)
Mixed	268 (14.6)
Total	1830 (100)
Number of doctors in practice	
1	252 (13.8)
2	210 (11.5)

Continued

**Table 3** Continued

Country	Number of respondents (% of all respondents)
3	196 (10.7)
4–5	304 (16.6)
6–7	235 (12.8)
8–9	153 (8.4)
10 or more	470 (25.7)
Not stated	10 (0.5)
Total	1830 (100)

**Factor 1: primary care practitioners' ability to refer**

This factor contained six items. A higher score on this factor indicated lower barriers to specialist referral, more time during the consultation to consider whether the patient needs a referral and absence of criticism from colleagues over referrals that were perceived to be unnecessary. This factor explained 15.5% of the variance of individual responses. A comparison of national scores for factor 1 is shown in [figure 1](#).

**Factor 2: degree of direct patient access to secondary care**

This factor contained six items. A higher score for this factor was linked with items relating to direct patient access to secondary care: the absence of a GP gatekeeping role, with higher financial and geographical barriers to healthcare for some patients, and in some cases the presence of a quota for diagnostic tests. Higher scores for this factor were also linked with less likelihood of having a fast-track specialist appointment system for patients with suspected cancer. Factor 2 explained 10.8% of the variance of individual responses, and the comparison of national scores for this factor is shown in [figure 2](#).

**Factor 3: primary care practitioners' perceptions of being under pressure**

This factor contained four items. A higher score was linked with perceptions of pressure on the PCP from a high workload, as well as demands from patients, the public and the health system. It explained 7.6% of the variance of individual responses. A comparison of national scores for factor 3 is shown in [figure 3](#).

**Factor 4: expectations of the primary care practitioners' role**

This factor contained two items. A higher score for this factor was associated with higher expectations of PCP-centred care, and the presence of guidelines to support PCP decision-making. It explained 6.7% of the variance of individual responses, and a comparison of national scores for this factor is shown in [figure 4](#).

**Factor 5: quality before cost**

This factor contained two items. A higher score was linked with PCP perceptions that in their systems high quality care for patients was more important than costs, and that financial aspects had less effect on their referral

**Table 4** Mean national Likert-scale values for each of the 20 questions

	Bulgaria	Croatia	Denmark	England	Finland	France	Germany	Greece	Israel	Italy	Netherlands	Norway	Poland	Portugal	Romania	Scotland	Slovenia	Spain	Sweden	Switzerland
Common presentations are covered by local or national guidelines that usually give advice on which patients to refer.	2.76	3.22	3.96	3.92	4.00	3.04	3.35	3.59	3.64	3.40	3.96	3.26	3.44	3.12	3.37	3.89	3.73	3.90	3.59	3.37
The local health system encourages us to refer any patients with possible cancer early, even if there is a low risk of cancer.	2.78	3.00	3.91	3.29	2.97	3.29	3.79	3.37	3.60	3.05	2.84	3.20	3.18	2.97	3.68	3.31	3.28	3.07	2.91	4.05
In my practice, patients often have to travel a long way to see a specialist.	1.91	2.45	2.02	2.44	1.62	1.98	1.76	3.24	2.40	2.83	1.79	1.89	2.54	1.90	2.78	2.74	2.34	1.99	2.59	1.68
I am able to refer directly to a named specialist.	3.80	2.73	4.28	2.10	1.95	4.55	4.60	3.90	4.49	3.24	3.92	3.84	2.73	2.81	3.83	2.35	2.73	3.79	2.31	4.90
I am able to refer to a specialist that I know personally.	4.14	2.89	3.38	2.02	2.00	4.24	4.39	3.86	4.26	3.41	3.74	2.67	2.77	2.27	3.81	2.34	2.92	2.52	2.29	4.87
I can easily telephone (or email) a specialist for informal discussion and advice.	3.36	2.52	3.68	3.16	3.90	3.80	4.21	3.07	3.82	3.13	4.18	3.25	1.69	2.71	3.25	3.23	2.51	3.39	4.04	4.73
Here, specialists usually welcome referrals.	4.37	2.85	3.36	3.35	3.48	4.18	3.89	3.31	3.88	3.21	4.02	3.79	2.29	3.14	3.01	3.06	2.21	2.68	3.37	4.70
Seeing a specialist can be a problem for some of my patients because of the financial cost to them.	3.22	2.82	1.74	2.28	2.64	4.06	1.74	4.36	2.21	3.70	3.90	2.15	3.13	2.71	3.80	2.02	2.70	2.12	2.04	2.32
We have a budget or quota (maximum limit) for diagnostic tests.	4.36	3.02	1.68	1.87	1.92	1.60	3.18	3.63	2.21	2.44	2.03	1.34	3.52	3.22	3.09	1.51	2.88	2.72	2.07	1.35
Here, high-quality care for an individual patient is always more important than costs.	3.20	3.53	3.95	3.85	3.77	3.75	3.23	3.51	3.91	3.48	3.76	3.59	3.38	3.95	3.87	3.89	3.74	3.67	4.03	4.08
Referring or not referring does not affect me at all financially.	2.69	3.13	4.41	4.07	4.20	4.67	4.18	3.68	4.33	3.31	4.28	4.46	3.52	4.29	3.99	4.43	4.04	3.63	4.26	4.27
Referral costs are usually paid by insurance companies, not hospital or primary care budgets.	2.76	3.41	1.00	1.63	1.33	2.88	3.56	2.10	2.84	1.94	4.00	1.78	2.71	1.63	3.70	1.66	4.13	1.84	1.41	4.48
My colleagues sometimes criticise me if I have referred a patient to them, but they think that I should have been able to manage the patient myself.	2.08	2.76	1.90	2.39	2.51	2.19	1.48	2.92	2.11	2.63	2.29	2.58	3.38	2.53	2.72	2.40	3.24	2.41	2.65	1.27
In general, patients prefer a general practitioner (GP), rather than a specialist, to look after them.	3.12	3.09	3.40	3.00	2.61	3.00	3.67	3.56	3.52	3.30	3.53	2.99	2.98	3.12	3.53	3.23	3.49	3.22	3.12	3.65
We have access to a fast-track specialist appointment system for patients with suspected cancer.	2.71	3.22	4.75	4.66	4.08	3.46	2.87	2.45	3.33	3.22	4.30	4.67	3.63	3.42	2.58	4.37	3.22	4.06	3.31	2.27
Patients can self-refer to specialists, so GPs do not need to act as gatekeepers.	2.39	2.04	1.41	1.39	1.92	2.29	3.19	2.58	3.10	2.65	1.61	1.59	1.83	1.86	2.38	1.38	1.55	1.45	2.75	3.02
I am usually very busy, so I sometimes refer to help reduce my workload.	2.73	2.16	2.61	2.53	2.59	2.48	1.98	2.24	2.98	2.56	2.51	2.40	2.82	2.12	1.96	1.92	3.01	2.43	2.15	1.97

Continued

Table 4 Continued

	Bulgaria	Croatia	Denmark	England	Finland	France	Germany	Greece	Israel	Italy	Netherlands	Norway	Poland	Portugal	Romania	Scotland	Slovenia	Spain	Sweden	Switzerland
I usually have enough time in the consultation to think carefully about whether the patient needs a referral.	3.32	3.52	3.43	3.02	3.15	3.77	3.86	3.49	3.16	3.67	3.59	3.75	2.64	2.58	3.90	3.29	2.91	2.83	3.16	3.69
I am likely to refer if the patient says that she/he would like to be referred, even if there are no 'red flags'.	3.10	2.59	3.02	3.20	2.51	2.96	3.62	3.42	3.69	3.36	2.92	3.11	3.63	3.05	2.80	3.00	3.30	2.88	3.06	3.52
We are under media (newspaper, television) or public pressure to refer earlier.	3.84	3.04	3.38	3.97	2.82	2.81	4.16	2.69	3.16	3.42	3.10	3.80	3.61	2.42	2.65	3.92	3.36	3.23	2.50	2.77

A response of 'strongly disagree' was given a score of 1; 'disagree' =2; 'neither agree nor disagree' =3; 'agree' =4; 'strongly agree' =5.

decision-making. This factor explained 6.4% of the variance of individual responses. A comparison of national scores for factor 5 is shown in [figure 5](#).

### Sensitivity analysis

In a sensitivity analysis with weighting of the responses to adjust for the differing numbers of respondents per country, only one statement moved to a different factor: the statement "In my practice, patients often have to travel a long way to see a specialist" moved from factor 2 to factor 4.

## DISCUSSION

### Principal findings

Based on a content validity process, a 45-item pool on referral decision-making for patients who could have cancer was reduced to a 20-item questionnaire. From the responses of 1830 PCPs, from 25 primary care centres in 20 European countries, 5 key factors were identified: PCPs' ability to refer; degree of direct patient access to secondary care; PCP perceptions of being under pressure; expectations of the PCPs' role; and the extent to which PCPs believe that, in their systems, quality comes before cost. The factors showed significant variation between the participant countries.

### Interpretation of the results

Based on the content validity and the significant variation between countries, the survey can be regarded as relevant for studying aspects of PCPs' perceptions of what affects their referral and investigation of patients with symptoms that could be due to cancer. Thus, the developed questionnaire could be used in further research to evaluate associations with cancer outcomes, and could also be used to evaluate changes in healthcare systems regarding referring patients who could have cancer.

Factor 1. PCPs' ability to refer: the variation in PCPs' ability to refer was linked to structural differences like barriers to specialist referrals (including waiting times), the degree of criticism of PCPs relating to their referrals, the quality of relationships between PCPs and specialists and the length of the PCPs' consultations with patients. This was the most important factor, carrying most of the explained variation, and consequently it appears to be particularly important in explaining between-country differences in primary care cancer diagnosis.

Factor 2. Degree of direct patient access to secondary care: this important factor was related to the extent to which GPs were gatekeepers and to which public systems provided universal access to healthcare, whether self-referral to specialists was possible outside the public health system, patients' ability to travel to and fund specialist consultations and whether fast-track referral systems were in place for patients with suspected cancer.

Factor 3. PCPs' perceptions of being under pressure: variations in PCPs' perceptions of being under pressure were linked with PCP workloads, patient expectations



**Table 5** Health system items and their factor analysis loadings The highest-scoring component for each item is italicised.

Health system item	Component				
	1	2	3	4	5
<b>Factor 1</b>					
I am able to refer to a specialist that I know personally.	0.68	0.42	0.09	0.03	-0.14
Here, specialists usually welcome referrals.	0.68	0.02	0.12	-0.04	-0.11
I can easily telephone (or email) a specialist for informal discussion and advice.	0.68	-0.12	0.11	0.17	-0.12
I am able to refer directly to a named specialist.	0.62	0.22	0.22	0.13	-0.26
I usually have enough time in the consultation to think carefully about whether the patient needs a referral.	0.57	-0.02	-0.32	0.07	0.12
My colleagues sometimes criticise me if I have referred a patient to them, but they think that I should have been able to manage the patient myself.	-0.51	0.25	0.14	0.12	0.31
<b>Factor 2</b>					
Seeing a specialist can be a problem for some of my patients because of the financial cost to them.	-0.08	0.59	-0.17	0.27	0.24
We have access to a fast-track specialist appointment system for patients with suspected cancer.	0.05	-0.54	0.34	0.34	-0.03
We have a budget or quota (maximum limit) for diagnostic tests.	-0.27	0.54	-0.06	0.25	-0.26
Referral costs are usually paid by insurance companies, not hospital or primary care budgets.	0.30	0.46	-0.05	-0.19	0.23
Patients can self-refer to specialists, so GPs do not need to act as gatekeepers.	0.34	0.44	0.04	-0.30	0.11
In my practice, patients often have to travel a long way to see a specialist.	-0.26	0.38	-0.09	0.37	0.36
<b>Factor 3</b>					
I am usually very busy, so I sometimes refer to help reduce my workload.	-0.32	0.19	0.60	-0.09	-0.01
I am likely to refer if the patient says that she/he would like to be referred, even if there are no 'red flags'.	-0.02	0.29	0.53	-0.34	0.16
We are under media (newspaper, television) or public pressure to refer earlier.	-0.20	0.08	0.51	-0.09	-0.16
The local health system encourages us to refer any patients with possible cancer early, even if there is a low risk of cancer.	0.26	0.11	0.36	0.23	0.20
<b>Factor 4</b>					
Common presentations are covered by local or national guidelines that usually give advice on which patients to refer	0.05	-0.25	0.33	0.55	0.15
In general, patients prefer a GP, rather than a specialist, to look after them.	0.25	0.19	-0.02	0.41	0.08
<b>Factor 5</b>					
Here, high-quality care for an individual patient is always more important than costs.	0.30	-0.26	0.01	0.05	0.57
Referring or not referring does not affect me at all financially.	0.31	-0.29	0.08	-0.34	0.55

and their level of trust in their doctors and the extent to which health systems expected PCPs to refer patients.

Factor 4. Expectations of the PCPs' role: differing expectations of the PCPs' role were related to whether there had been a shift of work and responsibility between secondary and primary care, and the extent to which patient care was from specialists rather than from PCPs.

Factor 5. Quality before cost: the variation in the extent to which PCPs perceived the balance between quality of care and cost was linked with how much PCPs themselves were directly affected by considerations of cost.

### Strengths and weaknesses of the study

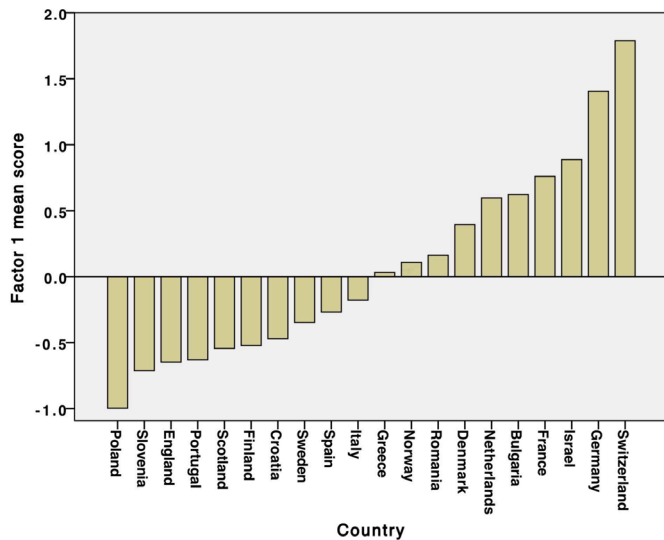
There were participating centres in four countries from each of the Central, Eastern, Northern, Southern and Western

European geographical areas, providing variation in geography, health systems and levels of healthcare spending. It included the views of PCPs who are not usually involved in research. The questionnaire was carefully developed and piloted by GPs and other PCPs, and therefore grounded in their clinical experience. The sensitivity analysis suggested that the factor structure is robust and not driven by countries with larger numbers of respondents.

While low survey response rates are common in primary care<sup>35</sup> and are known to vary between countries, the response rates in our study were comparable to those of a recent ICBP survey, in which response rates varied from 5.5% to 45.6%.<sup>26</sup> As the survey was anonymous, we have no data on non-responders. It is possible that the PCPs with the

**Table 6** Factor means for each country with 95% CIs

	Number of respondents	Factor 1		Factor 2		Factor 3		Factor 4		Factor 5	
		Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)		
Bulgaria	52	0.62 (0.43 to 0.82)	0.58 (0.34 to 0.82)	0.23 (-0.12 to 0.59)	-1.11 (-1.50 to -0.72)	-1.43 (-1.74 to -1.11)					
Croatia	56	-0.47 (-0.70 to -0.24)	0.42 (0.21 to 0.62)	-0.48 (-0.74 to -0.21)	-0.46 (-0.78 to -0.14)	-0.53 (-0.81 to -0.25)					
Denmark	92	0.39 (0.25 to 0.54)	-1.04 (-1.15 to -0.93)	0.15 (-0.04 to 0.35)	0.59 (0.43 to 0.76)	0.41 (0.26 to 0.57)					
England	62	-0.65 (-0.85 to -0.45)	-0.90 (-1.09 to -0.71)	0.29 (0.06 to 0.51)	0.31 (0.12 to 0.50)	0.34 (0.16 to 0.52)					
Finland	61	-0.52 (-0.70 to -0.34)	-0.83 (-0.97 to -0.68)	-0.34 (-0.59 to -0.10)	-0.07 (-0.31 to 0.17)	0.38 (0.19 to 0.56)					
France	52	0.76 (0.57 to 0.95)	0.58 (0.41 to 0.75)	-0.23 (-0.50 to 0.04)	-0.27 (-0.51 to -0.03)	0.58 (0.42 to 0.74)					
Germany	91	1.41 (1.26 to 1.55)	0.40 (0.22 to 0.57)	0.43 (0.25 to 0.62)	-0.64 (-0.87 to -0.42)	0.02 (-0.23 to 0.27)					
Greece	59	0.03 (-0.18 to 0.24)	1.40 (1.21 to 1.60)	-0.21 (-0.46 to 0.03)	0.35 (0.03 to 0.67)	-0.61 (-0.86 to -0.37)					
Israel	58	0.89 (0.73 to 1.05)	0.48 (0.29 to 0.68)	0.67 (0.39 to 0.95)	-0.05 (-0.31 to 0.21)	0.49 (0.25 to 0.72)					
Italy	60	-0.18 (-0.44 to 0.08)	0.52 (0.32 to 0.73)	-0.07 (-0.38 to 0.25)	-0.06 (-0.34 to 0.21)	-0.45 (-0.82 to -0.09)					
Netherlands	108	0.60 (0.50 to 0.70)	0.23 (0.12 to 0.33)	-0.24 (-0.40 to -0.08)	0.44 (0.33 to 0.55)	0.29 (0.16 to 0.41)					
Norway	81	0.11 (-0.06 to 0.28)	-0.77 (-0.92 to -0.62)	0.16 (-0.04 to 0.36)	-0.18 (-0.35 to 0.00)	0.52 (0.36 to 0.68)					
Poland	135	-1.00 (-1.15 to -0.84)	0.40 (0.26 to 0.55)	0.70 (0.52 to 0.88)	-0.15 (-0.36 to 0.06)	-0.59 (-0.77 to -0.40)					
Portugal	59	-0.63 (-0.84 to -0.42)	-0.09 (-0.31 to 0.13)	-0.32 (-0.57 to -0.06)	-0.48 (-0.76 to -0.19)	0.01 (-0.20 to 0.22)					
Romania	146	0.16 (0.01 to 0.31)	1.30 (1.17 to 1.43)	-0.69 (-0.86 to -0.52)	0.11 (-0.05 to 0.28)	-0.03 (-0.19 to 0.13)					
Scotland	62	-0.54 (-0.72 to -0.37)	-0.71 (-0.88 to -0.53)	-0.14 (-0.33 to 0.05)	0.34 (0.14 to 0.55)	0.57 (0.39 to 0.75)					
Slovenia	91	-0.71 (-0.87 to -0.56)	0.53 (0.40 to 0.67)	0.48 (0.30 to 0.66)	0.08 (-0.13 to 0.28)	0.01 (-0.18 to 0.20)					
Spain	380	-0.27 (-0.35 to -0.19)	-0.67 (-0.75 to -0.60)	-0.03 (-0.13 to 0.07)	0.21 (0.12 to 0.31)	-0.36 (-0.46 to -0.26)					
Sweden	68	-0.35 (-0.52 to -0.18)	-0.11 (-0.27 to 0.06)	-0.42 (-0.64 to -0.20)	-0.21 (-0.45 to 0.03)	0.56 (0.34 to 0.79)					
Switzerland	60	1.79 (1.66 to 1.91)	0.78 (0.63 to 0.94)	-0.08 (-0.36 to 0.20)	-0.55 (-0.79 to -0.31)	0.91 (0.69 to 1.12)					
Total	1833										

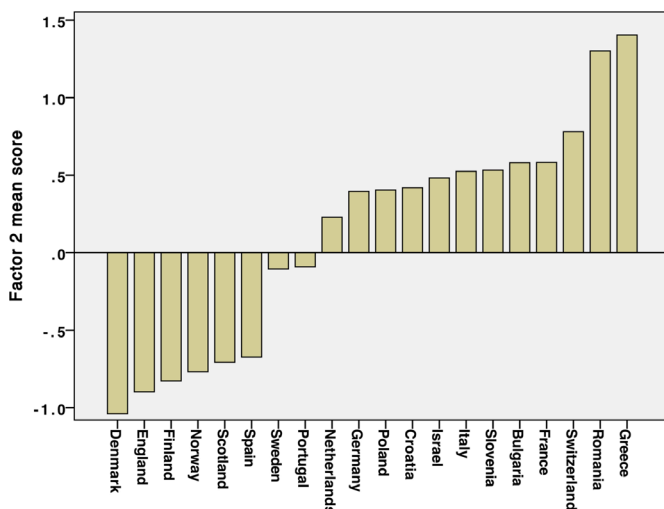


**Figure 1** Comparison of national scores for factor 1: primary care practitioner’s ability to refer. A higher score indicated lower barriers to specialist referral.

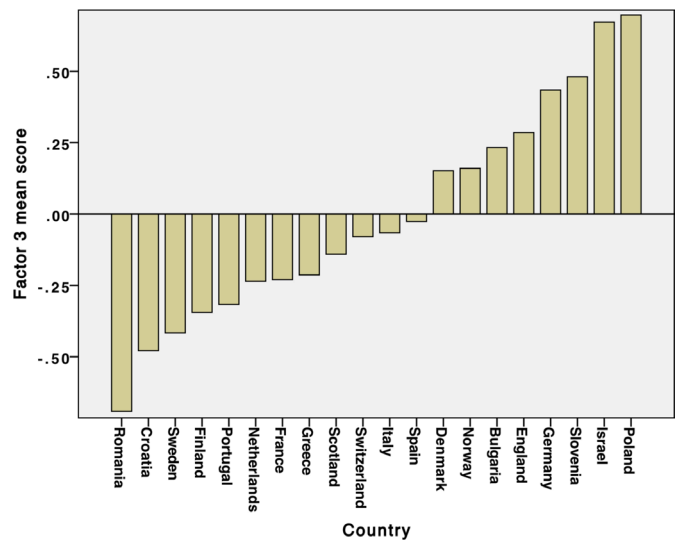
most interest in this subject were the most likely to respond. However, while this selection bias may have affected the factor loadings, it is unlikely to have changed the factor structure itself.

While the demographic data that we collected included the gender of participants and the number of years that they had been in practice, we have found no equivalent data on national PCP populations that would allow us to assess how representative our samples were.

Most samples were taken from each local lead’s own locality, and these may not have been representative of their nations as a whole.<sup>36</sup> While this makes it difficult to generalise the findings to each country, the variation between countries is relevant and valid. The recruitment method used in this study resulted in variable response rates,



**Figure 2** Comparison of national scores for factor 2: degree of direct patient access to secondary care. A higher score was linked with the absence of a general practitioner gate-keeping role, but higher financial and geographical barriers to healthcare for some patients.

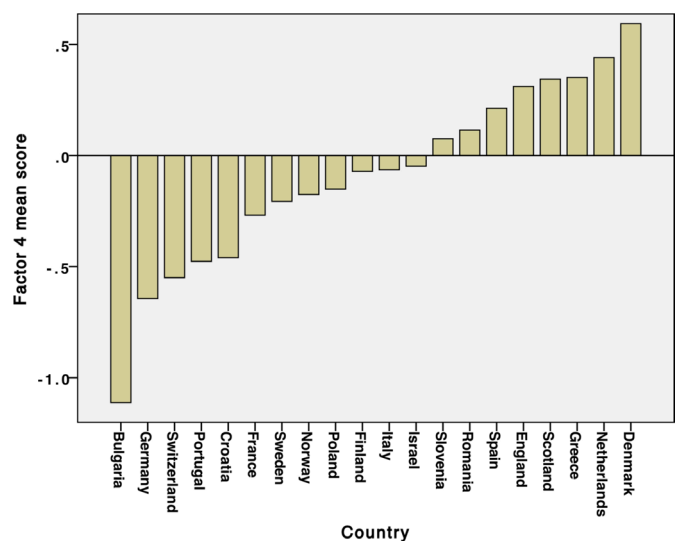


**Figure 3** Comparison of national scores for factor 3: pressure on primary care practitioners from outside. A higher score was linked with perceptions of higher pressure on the primary care practitioner.

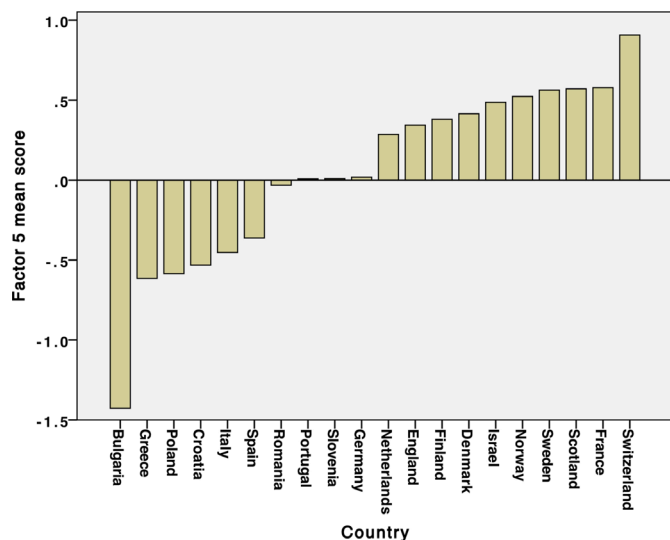
leading to a risk of non-response bias and loss of power.<sup>35</sup> However, the goal of 50 survey participants per centre and >1000 respondents in total was achieved.

Participants’ responses may have been influenced by previous questions, and there may have been country-level differences in response styles, for instance, choosing or avoiding the ‘extreme’ options on the scale.<sup>37</sup> As the translation also included a cultural adaptation we believe this bias was minimised, and the differences between countries cannot simply be explained by differences in response styles.

The five factors accounted for 47.4% of the variance in PCPs’ responses, and it is acceptable to consider a solution



**Figure 4** Comparison of national scores for factor 4: expectations of the primary care practitioner’s (PCPs’) role. A higher score was associated with higher expectations of PCP-centred care, and the presence of guidelines to support PCP decision-making.



**Figure 5** Comparison of national scores for factor 5: quality before cost. A higher score was linked with primary care practitioner perceptions that in their systems high quality care for patients was more important than costs.

that accounts for 60% or less of the total variance as satisfactory.<sup>38</sup> Two of the factors only included two items each, which makes them vulnerable to missing responses and stochastic variation.

### Comparison with other studies

To our knowledge, this is the first study that has been designed to identify the factors underlying PCPs' referral decision-making, and provide international comparisons of the extent to which PCPs themselves perceive these as important. An ICBP narrative review compared the characteristics of healthcare systems of six countries (Australia, Canada, Denmark, Norway, Sweden and the UK), aiming to identify characteristics that could possibly modify the diagnostic pathway.<sup>39</sup> However, unlike our study, it only explored the systems of relatively wealthy countries, and it did not examine PCPs' own perceptions of how their systems affected their decision-making. Our finding that PCPs in different European countries perceive different levels of access to investigations and specialist opinions may be relevant to the finding of varying referral delays in three European countries (Scotland, the Netherlands and Sweden).<sup>40</sup>

### Possible implications for clinicians and policymakers

Five health system factors were able to explain nearly half of the variation in the PCPs' responses to the items. This indicates that a relatively large part of the variation may be explained by differences between the health systems. Our study indicates the policy domains where countries might be able to modify their systems to better support their GPs and other PCPs in the timely referral and investigation of patients who could have cancer.

The most important of these factors were the ease of PCPs' ability to refer, and the degree of direct patient access to secondary care. These factors are key in supporting

earlier and expedited cancer diagnosis and may thus be linked with cancer outcomes. It therefore seems plausible that some countries could improve their cancer outcomes by providing better access to investigations and secondary care when cancer is suspected.

### Unanswered questions and future research

The five factors and their related scores should be compared with national cancer outcomes. These outcomes could include mortality, stage distribution and patient evaluations. An additional area of study could be to relate the factors and scores to national health system costs.

### CONCLUSIONS

This research has developed a 20-item questionnaire with good content and construct validity, and has identified five factors that PCPs perceive to affect their referral decision-making in patients that could have cancer. These appear to vary depending on the different European models of primary care. This understanding of the interaction between health system variables and PCP decision-making can help in an exploration of the differences in national cancer diagnostic pathways and cancer outcomes, and could help to inform health service policy and research towards better cancer outcomes.

### Author affiliations

- <sup>1</sup>Department for Health, University of Bath, Bath, UK
- <sup>2</sup>Institute of Primary Health Care Bern (BIHAM), University of Bern, Bern, Switzerland
- <sup>3</sup>Research Unit for General Practice, Aarhus University, Aarhus, Denmark
- <sup>4</sup>Research Unit, Majorca Primary Health Care Department, Balearic Islands Health Research Institute (IdISBa), Palma, Spain
- <sup>5</sup>Division of Applied Health Sciences—Academic Primary Care, University of Aberdeen, Aberdeen, UK
- <sup>6</sup>Department of General Practice, Université Paris Diderot, Paris, France
- <sup>7</sup>Department of Family Medicine, Sackler Medical School, Tel Aviv University, Tel Aviv, Israel
- <sup>8</sup>Department of General Practice and General Practice Research Unit, University of Oslo, Oslo, Norway
- <sup>9</sup>Department of Family Medicine, Nicolaus Copernicus University, Toruń, Poland
- <sup>10</sup>Department of General Practice, National Society of Medical Education in General Practice (SNaMID), Caserta, Italy
- <sup>11</sup>Family Medicine Department, Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania
- <sup>12</sup>Department of General Practice, Maastricht University, Maastricht, The Netherlands
- <sup>13</sup>Medical Center BROD, Plovdiv, Bulgaria
- <sup>14</sup>Odjel Socijalne Medicine, The Teaching Institute of Public Health of Primorsko-goranska County, Rijeka, Croatia
- <sup>15</sup>Primary Health Centre, Centro de Saúde Sarria, Sarria, Spain
- <sup>16</sup>Department of General Practice, Faculty of Medicine and Life Sciences, University of Tampere, Tampere, Finland
- <sup>17</sup>Unitat de Suport a la Recerca, IDIAP Jordi Gol, Institut Catala De La Salut, Barcelona, Spain
- <sup>18</sup>Centre for Health Policy, Institute of Global Health Innovation, Imperial College London, London, UK
- <sup>19</sup>CINTESIS (Center for Health Technology and Services Research) and MEDCIDS (Department of Community Medicine, Information and Health Decision Sciences), Faculty of Medicine, University of Porto, Porto, Portugal
- <sup>20</sup>Department of Family Medicine, University of Ljubljana, Ljubljana, Slovenia
- <sup>21</sup>Department of Family Medicine, Medical University of Białystok, Białystok, Poland
- <sup>22</sup>Institute of General Practice and Health Services Research, Technische Universität München, Munich, Germany

<sup>23</sup>Laboratory of Primary Health Care, General Practice and Health Services Research, Aristotle University of Thessaloniki, Thessaloniki, Greece

<sup>24</sup>Department of Clinical Sciences, Lund University, Malmö, Sweden

<sup>25</sup>Institute for Family Medicine and General Practice, University of Bonn, Bonn, Germany

**Acknowledgements** The authors would like to thank all the PCPs who piloted the questionnaire and those who completed the survey. They would also like to thank the European GP Research Network for its support. They are grateful to Professor Barbara Silverman and Professor Lital Keinan for the data on cancer survival rates in Israel.

**Contributors** IA-A, JA, KB, MB, NB, EC, G-JD, ME, GF, SGB, MH, RH, EJ, TK, MM-C, PM, ALN, DP, MPS, JS-P, AS, ES, SS, GT, HT, PV and BW participated in the study design. All authors except GT were involved in the data collection. All authors contributed to the writing and to the review of the manuscript and approved the final version. MH had overall responsibility for the study design, recruitment of local leads, analysis of data and interpretation of results. GT advised on the study design and the statistical analysis.

**Funding** ALN is supported by the National Institute for Health Research (NIHR) Imperial Patient Safety Translation Research Centre, with infrastructure support provided by the NIHR Imperial Biomedical Research Centre (BRC).

**Competing interests** None declared.

**Patient consent** Not required.

**Ethics approval** University of Bath Research Ethics Approval Committee for Health.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** The Örenäs survey data used in this study is available at <https://doi.org/10.15125/BATH-00486>.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## REFERENCES

- EUROCARE. EUROCARE-5. Tumori IN, ed. *Milan and Rome*. Italy: Milan IaiSdSR, 2014.
- Carter JL, Coletti RJ, Harris RP. Quantifying and monitoring overdiagnosis in cancer screening: a systematic review of methods. *BMJ* 2015;350:g7773.
- Zahl PH, Jørgensen KJ, Göttsche PC. Overestimated lead times in cancer screening has led to substantial underestimation of overdiagnosis. *Br J Cancer* 2013;109:2014–9.
- Richards MA. The size of the prize for earlier diagnosis of cancer in England. *Br J Cancer* 2009;101 Suppl 2:S125–S129.
- Woods LM, Coleman MP, Lawrence G, et al. Evidence against the proposition that "UK cancer survival statistics are misleading": simulation study with National Cancer Registry data. *BMJ* 2011;342:d3399.
- Thomson CS, Forman D. Cancer survival in England and the influence of early diagnosis: what can we learn from recent EUROCARE results? *Br J Cancer* 2009;101 Suppl 2:S102–S109.
- McLaughlin JM, Anderson RT, Ferketich AK, et al. Effect on survival of longer intervals between confirmed diagnosis and treatment initiation among low-income women with breast cancer. *J Clin Oncol* 2012;30:4493–500.
- Yun YH, Kim YA, Min YH, et al. The influence of hospital volume and surgical treatment delay on long-term survival after cancer surgery. *Ann Oncol* 2012;23:2731–7.
- Elit LM, O'Leary EM, Pond GR, et al. Impact of wait times on survival for women with uterine cancer. *J Clin Oncol* 2014;32:27–33.
- Nanthamongkolkul K, Hanprasertpong J. Longer waiting times for early stage cervical cancer patients undergoing radical hysterectomy are associated with diminished long-term overall survival. *J Gynecol Oncol* 2015;26:262–9.
- Neal RD, Tharmanathan P, France B, et al. Is increased time to diagnosis and treatment in symptomatic cancer associated with poorer outcomes? Systematic review. *Br J Cancer* 2015;112 Suppl 1:S92–S107.
- Tørring ML, Frydenberg M, Hansen RP, et al. Evidence of increasing mortality with longer diagnostic intervals for five common cancers: a cohort study in primary care. *Eur J Cancer* 2013;49:2187–98.
- Gobbi PG, Bergonzi M, Comelli M, et al. The prognostic role of time to diagnosis and presenting symptoms in patients with pancreatic cancer. *Cancer Epidemiol* 2013;37:186–90.
- De Angelis R, Sant M, Coleman MP, et al. Cancer survival in Europe 1999–2007 by country and age: results of EUROCARE--5-a population-based study. *Lancet Oncol* 2014;15:23–34.
- Coleman MP, Forman D, Bryant H, et al. Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995–2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data. *Lancet* 2011;377:127–38.
- Foot C, Harrison T. *How to improve cancer survival: explaining England's relatively poor rates*. London: The King's Fund, 2011. (30 Jan 2012).
- Hamilton W. Cancer diagnosis in primary care. *Br J Gen Pract* 2010;60:121–8.
- Franks P, Clancy CM, Nutting PA. Gatekeeping revisited--protecting patients from overtreatment. *N Engl J Med* 1992;327:424–9.
- Masseria C, Irwin R, Thomson S, et al. Primary care in Europe. TLSoEaP S, ed. *European Commission*, 2009.
- Vedsted P, Olesen F. Are the serious problems in cancer survival partly rooted in gatekeeper principles? An ecologic study. *Br J Gen Pract* 2011;61:e508–e512.
- Neal RD. Commentary. Cancer diagnosis - the role of urgent referral guidelines. *Br J Gen Pract* 2010;60:127.
- Harris M, Frey P, Esteva M, et al. How the probability of presentation to a primary care clinician correlates with cancer survival rates: a European survey using vignettes. *Scand J Prim Health Care* 2017;35:27–34.
- Rubin G, Vedsted P, Emery J. Improving cancer outcomes: better access to diagnostics in primary care could be critical. *Br J Gen Pract* 2011;61:317–8.
- Møller H, Gildea C, Meechan D, et al. Use of the English urgent referral pathway for suspected cancer and mortality in patients with cancer: cohort study. *BMJ* 2015;351:h5102.
- National Cancer Intelligence Network. *Routes to Diagnosis 2006–2013, preliminary results*. London: Public Health England, 2015.
- Rose PW, Rubin G, Perera-Salazar R, et al. Explaining variation in cancer survival between 11 jurisdictions in the international cancer benchmarking partnership: a primary care vignette survey. *BMJ Open* 2015;5:e007212.
- Harris M, Frey P, Esteva M, et al. How health system factors influence referral decisions in patients that may have cancer: European symposium report. *J Cancer Res Ther* 2016;7–10.
- Harris M, Taylor G; Örenäs Research Group. How health system factors affect primary care practitioners' decisions to refer patients for further investigation: protocol for a pan-European ecological study. *BMC Health Serv Res* 2018;18:338.
- Maneesriwongul W, Dixon JK. Instrument translation process: a methods review. *J Adv Nurs* 2004;48:175–86.
- Center for Aging in Diverse Communities. *Guidelines for Translating Surveys in Cross-Cultural Research*. San Francisco: University of California, 2007.
- Dobrow MJ, Orchard MC, Golden B, et al. Response audit of an internet survey of health care providers and administrators: implications for determination of response rates. *J Med Internet Res* 2008;10:e30.
- van Belle G. *Statistical Rules of Thumb*. 2nd Edition. Hoboken: NJ: Wiley, 2008.
- Shaghghi A, Bhopal RS, Sheikh A. Approaches to recruiting 'hard-to-reach' populations into re-search: a review of the literature. *Health Promot Perspect* 2011;1:86–94.
- Hotelling H. Analysis of a complex of statistical variables into principal components. *J Educ Psychol* 1933;24:417–41.
- Pit SW, Vo T, Pyakurel S. The effectiveness of recruitment strategies on general practitioner's survey response rates - a systematic review. *BMC Med Res Methodol* 2014;14:76.
- Greenacre ZA. The importance of selection bias in internet surveys. *Open J Stat* 2016;06:397–404.
- Harzing A-W. Response styles in cross-national survey research. *International Journal of Cross Cultural Management* 2006;6:243–66.
- Hair J, Black W, Babin B, et al; *Multivariate Data Analysis*. 7th ed: Pearson, 2009.
- Brown S, Castelli M, Hunter DJ, et al. How might healthcare systems influence speed of cancer diagnosis: a narrative review. *Soc Sci Med* 2014;116:56–63.
- Murchie P, Campbell NC, Delaney EK, et al. Comparing diagnostic delay in cancer: a cross-sectional study in three European countries with primary care-led health care systems. *Fam Pract* 2012;29:69–78.