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Variation in suspected cancer referral pathways across the International Cancer Benchmarking Partnership: a comparative analysis

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Abstract

Background: International variation in cancer outcomes persist. Differences in the accessibility and organisation of cancer patient pathways may influence this. More evidence is needed to understand what extent variations in the structure of primary care referral pathways for cancer investigation contribute to differences in timeliness of diagnoses and cancer outcomes.

Aim: To explore the variation in primary care referral pathways for the management of suspected cancer across the International Cancer Benchmarking Partnership countries.

Design: Descriptive comparative analysis; mixed methods.

Methods: Schematics of primary care referral pathways were developed across 10 ICBP jurisdictions. The Aarhus statement initially informed the development of the schematics, further supplemented with expert insights through consultation of leading experts in primary care and cancer, existing ICBP, focussed review of existing evidence on the management of suspected cancer, published primary care cancer guidelines, and evaluations of referral tools and initiatives within primary care.

Results: Referral pathway schematics for 10 ICBP jurisdictions are presented alongside a descriptive comparison of the organisation of primary care management of suspected cancer. Several key areas of variation were identified: inflexibility of referral pathways, lack of a managed route for non-specific symptoms, primary care practitioner decision-making autonomy, direct access to investigations and use of emergency routes.

Conclusion: Highlighting differences in referral processes can stimulate further research to better understand the impact of this variation on timeliness of diagnoses and cancer outcomes. Studying these schematics in local contexts may identify opportunities to improve care and facilitate discussions of what may constitute best referral practice.

Keywords: primary care, cancer, diagnosis, referral

How this fits in

There remains significant interest in understanding the components of primary care management of suspected cancer that may contribute to timeliness of diagnoses and cancer outcomes. This study has generated novel insight into the structure and organisation of primary care investigation of suspected cancer internationally. By comparing between similar countries, this work can help facilitate understanding of potential best practice in other countries and stimulate further research to understand drivers of more favourable cancer outcomes. The schematics developed can support identification of opportunities and key considerations for when looking to optimise referral pathways within cancer care.

Background

International variation persists in cancer stage at diagnosis and cancer survival (1-6). Evidence exists highlighting associations between expedited diagnosis and reduced mortality, improved 1-year survival, and improved experience of care (7, 8). These associations are not universal for all cancers, with poorer outcomes associated with shorter intervals for some cancers, and improved outcomes with longer intervals for others (9). Sometimes known as the j-shaped curve, this typically happens when critically ill patients who need urgent care, have some of their pathways expedited, meaning they have shorter intervals and timescales, as well as poorer outcomes (10). Furthermore, some countries with the highest survival report the longest diagnostic intervals (2, 11). This variation suggests that there are hidden complexities which underpin the association between time to diagnosis and cancer outcomes that require further exploration. Primary care is a priority area for initiatives aimed at reducing diagnostic delay as the majority of patients with symptoms of possible cancer first attend primary care (12, 13).

Complexity is a recognised challenge within healthcare- defined as '*a dynamic and constantly emerging set of processes and objects that not only interact with each other but come to be defined by those interactions'* (14-16). Previous studies have used schematic and logic modelling to help visualise the complexity that exists in healthcare (14). Diagnosing cancer in primary care is complex as it is a relatively rare diagnosis that may present with a range of undifferentiated symptoms shared with benign illness (Figure 1) (13, 17, 18). Patient-related factors (e.g., symptom awareness, negative beliefs about outcomes) and health system factors (e.g., accessibility, guidelines, capacity, resource) influence primary care attendance and onward referral (19-21). International differences exist in primary care practitioner (PCP) responsibility for follow-up, access to investigations, and readiness to refer (19, 22, 23). Research is needed to understand whether there is international variation in the diagnostic options available to PCPs that could impact cancer outcomes, and to what extent this impact could be.

In this study, we aimed to map referral pathways for ten countries within the International Cancer Benchmarking Partnership (ICBP) using pathway schematics. We explore variation in pathways between ICBP countries to understand whether the complexity of these pathways may play a role in timeliness of cancer diagnosis and, more broadly, variation in cancer outcomes. By generating better understanding of the differences in primary care referral pathway, we aim to identify potential areas for improvement by country or jurisdiction.

Methods

We have used a descriptive approach to develop and compare schematics of referral pathways for suspected cancer across 10 ICBP jurisdictions (Australia, British Columbia in Canada, Denmark, England, Ireland, New Zealand, Northern Ireland, Norway, Scotland, Wales). The ICBP is a global collaboration of clinicians, policymakers, researchers, and cancer data experts, aiming to explain cancer survival differences across 21 jurisdictions in 7 high-income countries with comprehensive cancer registry coverage, similar national health system expenditure, and universal access to healthcare. The ICBP was formed in 2009 and has consisted of jurisdictions and countries that also represent a range of cancer survival and are comparable with their key health policy issues(24). The selection of ICBP jurisdictions in this study was discussed and agreed with members of the ICBP Programme Board, driven by the purpose of conducting an exploratory analysis to provide an initial descriptive understanding representing the ICBP countries.

Defining scope

Our scope was informed by existing ICBP data, predominantly from studies investigating primary care referral behaviour, primary care health system mapping, and length of the cancer pathway intervals (Figure 2) (1, 2, 19, 22). We performed targeted searches of the primary care literature on the management of suspected cancer in primary care, published primary care guidelines for the investigation of suspected cancer, and evaluations of health system performance (e.g., audits). We categorised our findings following the diagnostic steps laid out in the Aarhus Statement (25) (Figure 2). We used the following definitions:

- PCP assessment of cancer risk ('First presentation/clinical appearance')
- Investigations ('First investigation, primary care responsible for the patient')
- Onward referral ('First referral to secondary care/refer responsibility')
- Resulting action from referral ('First referral to secondary care/refer responsibility' and 'First specialist visit' where crossover existed)
- Cancer diagnosis – this was used as an end point for the schematics, but our focus was on primary care management of suspected cancer so there is less detail on secondary care referrals and investigations leading to a confirmed diagnosis in the schematics

We initially aimed to focus on the relative complexity of pathways, but by supplementing the schematic development with key informant insight, it became apparent that the flexibility within the referral and investigation process for PCPs was an important differentiator between jurisdictions.

Key Informant Engagement

A working group was formed of 11 leading primary care cancer research experts across the 10 ICBP countries to further develop our understanding of the international variation in the diagnostic sections highlighted in Figure 2. Each country had one representative apart from Denmark, where there were two. Identification of working group members was based upon individual research expertise, positions held in primary care, and utilising existing ICBP clinical networks. Semi-structured survey questions (Box 1) were developed to address evidence 'gaps' identified during the initial scoping and targeted literature searches. Members of the working group were asked to complete the survey which was followed up with further consultation and roundtable discussion.

Pathway Schematic Development

Process Flow Diagrams, used to illustrate separate steps of a process in sequential order, were used to design the schematics (26, 27). Pathway Schematics were developed to reflect clinical practice up to 2019 based on the evidence identified during scoping and the insights gained from the working group. The schematics represent the diagnostic steps from initial PCP assessment for cancer risk, to PCP investigation and onward referral, then the resulting action following referral, through to cancer diagnosis (Table 1). Schematics underwent multiple rounds of review with the working Group to ensure accurate reflection of primary care practice. Additional PCPs were consulted via the working Group contacts where appropriate to gain wider consensus. Schematics were developed using Lucid software Inc. and a graphic designer.

Results

The schematics illustrate the steps in place to support PCP referral of suspected cancer in each jurisdiction (Supplementary Figure 1). They are organised reflective of the overall survival trends across cancer sites (1- and 5-year survival) from the ICBP benchmarking project in descending order from highest to lowest survival to illustrate which characteristics of the pathways exist in countries with lower survival (3). Supplementary Table 2 details the processes involved at each step to further emphasise variation across jurisdictions.

PCP assessment of cancer risk and direct access investigations

In all jurisdictions the health systems involve initial assessment of patients in primary care, including guidance for primary care management of symptoms and test results. Direct access to simple PCP-led investigations (urine and blood tests) was universal across jurisdictions, with results being used to select patients for PCP referrals. Substantial variation existed between and within jurisdictions in the provision of direct access to specialist investigations (radiological and endoscopic), despite guidelines and recommendations supporting direct access to specialist investigation being common. It was noted that a greater PCP ease of access to a wide range of specialist investigations was found in Australia, particularly radiological tests such as CT scans.

Referral for further investigation

Various mechanisms for referral exist across jurisdictions that were both unmanaged (contacting specialist informally e.g., Australia, Ireland) and managed (formal pathways with defined referral criteria and thresholds e.g., Denmark, UK). Dedicated referral pathways for vague symptoms existed in Denmark and Norway, with increasing access to these pathways in Scotland, Wales, and England. Diagnostic centres existed in various formats across jurisdictions for both cancer-specific (e.g., British Columbia, Ireland) and non-specific symptoms (e.g., Denmark, England, Norway, Wales). Variation was noted in the route to emergency assessment, from managed routes to ensure very rapid investigation (e.g., Australia), through to unmanaged routes (e.g., Ireland, England). The option to refer for emergency assessment exists in Norway but the use of it is very rare and has not been reflected in Norway's schematic.

Resulting action from referral

The diagnosis of cancer was confirmed by specialists in all jurisdictions, but variation existed in the organisation of specialist assessment e.g., within pathways, contacted directly, or indirectly within departments.

Discussion

Summary of findings.

The schematics of referral pathways for patients with suspected cancer attending primary care developed illustrate high-level variation between international jurisdictions. There were notable sources of variation: PCP autonomy, flexibility of pathways, dedicated non-specific symptom pathways, and the function of emergency assessment. Through supplementing the schematic development with key informant insight, it became apparent that the flexibility in the referral process was a notable point of difference between jurisdictions. Autonomy refers to the ability of PCPs to flexibly investigate and refer patients they suspect may have undiagnosed cancer without referral justification or specialist triage of referrals. Referral justification aims to ensure that only the highest risk populations of patients are investigated within systems with finite resources and can be mediated by restrictive referral guidance and criteria, and specialist triage of PCP referrals. This may become a barrier to PCP referral and investigation if clinical judgement does not align with guideline criteria or specialist opinion. Dedicated referral pathways for patients with non-specific symptoms have been/are being introduced in Denmark, Norway, England, Scotland, and Wales (28-30). These pathways reduce the complexity of the referral process for a group of patients that have historically fallen outside the guideline criteria. These may not be necessary in jurisdictions where there are fewer barriers to rapid investigation, as was reported to be the case in Australia.

Emerging evidence shows that patients diagnosed via emergency routes have poorer outcomes and patient experiences (31, 32). However, we highlight that PCPs from jurisdictions with relatively good survival may access emergency assessment as a managed route to diagnosis as a solution to ensure expedited access to investigation, without being detriment to health system resource. Further research triangulating the schematics with emergency presentation proportion and survival estimates will help deepen the understanding of this interaction.

Strengths and limitations

The major strength of this study is that it provides the first international comparison of referral pathways at this level. To articulate each step from patient presentation to their PCP through to confirmed diagnosis of cancer is a challenging and complex task, but we have provided a novel understanding of this landscape by using pathway schematics. They are underpinned by targeted literature searches and key informant insights from the 10 ICBP jurisdictions.

We acknowledge that the schematics are an oversimplification of clinical practice in each jurisdiction, but they provide a robust baseline to understand the high-level structures and processes in place. We also acknowledge regional and national variation within jurisdictions and between cancers exists. The schematics developed can help direct future research and exploration within individual ICBP countries, and other countries outside of the ICBP, to better understand system level drivers of more favourable survival and stage at diagnosis.

There are additional factors that may influence referral pathways that could shed further light on the variation between countries that we were unable to capture within this study. These include factors such as patient demographics, socioeconomic factors and real-world referral behaviours and practices which can vary on a much smaller scale than what was explored in this study e.g., between individual PCPs. Capturing this data comprehensively across

multiple countries would be challenging and was out of scope for this study but should be considered for future research.

There is no established methodology for measuring complexity within cancer referral pathways, or in healthcare more generally. We developed our own approach combining targeted literature searching, guideline review, and key informant interviews. This is an area that future research could target to develop a robust and validated methodology.

Comparison with existing literature

We found no comparable research mapping cancer referral pathways, although there have been considerable attempts to understand health system factors influencing the timeliness of diagnosis (1, 2, 14, 19, 22, 33-35). The role of gatekeeping, whilst providing greater coordination and improving access to care, has been described as a barrier to the timeliness of diagnosis, and subsequently countries have made efforts to soften this (36). Research has also been undertaken into the development and implementation of pathways to evaluate care, rather than exploring them from a systems approach (37, 38). This study addresses an evidence gap, as the schematics help us to understand what is happening at this pathway and routes to diagnosis level, with a particular focus on primary care. It connects the understanding of international variation with snapshots of the situation in each ICBP jurisdiction, to help internal reviews to streamline pathways, supported by sharing of international practice.

Implications for research and/or practice

Allowing more flexibility and less restrictive referral processes, with greater direct access to investigations, and open channels of communication with secondary care may lead to a timelier cancer diagnosis. Australia consistently reports higher cancer survival and more favourable stage distributions (3-6). Key informants noted flexibility within the Australian system including direct access to investigations, PCP referral autonomy, and free movement of patients between the public and private systems. However, this should be caveated with the existence of disparities in access to care, particularly for indigenous communities (39). Danish cancer outcomes markedly improved following health system reforms including the implementation of cancer-specific pathways, pathways for non-specific potentially serious symptoms, and coordinated diagnostic centres (40). These examples showcase that there is no ‘one size fits all’ approach, but shows that flexible, well-resourced, adaptable referral pathways are likely to be key components to help drive timely diagnosis.

We anticipate the schematics will facilitate discussions within jurisdictions of what constitutes best referral practice. Highlighting differences may lead to initiatives to better understand the impact of variation in delays of diagnosis and to improve care within each jurisdiction. Future research should focus on understanding nuances in referral processes at a local level and between cancer-site-specific pathways, by developing methodologies to map real-world referral patterns using routinely collected health-system data.

Whilst efforts should be made to improve the diagnostic process through better access and greater flexibility, this cannot progress without adequate resource, workforce and capacity. Ensuring this should be of focus for policymakers internationally to drive improvements in care.

Conclusion

Our findings add to our understanding of whether health system factors contribute to international variation in cancer survival, PCP referral behaviour, and diagnostic intervals. Studying these schematics in local contexts, can help identify opportunities to improve care in different countries and facilitate discussions of what may constitute best referral practice. Highlighting differences in referral processes could lead to initiatives to better understand the impact of this variation in delays in diagnosis and to improve care within each jurisdiction. When exploring how to optimise referral pathways, considerations should be given to more flexibility of referral justification, greater direct access to investigations, less restrictive referral processes and open channels of communication with secondary care. Targeting interventions at these areas through policy and practice may achieve timelier diagnoses, better efficiency of care, and potentially improved outcomes.

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Conflict of Interest Statement

The Authors declare that there is no conflict of interest.

Ethics Statement

Ethical Approval is not applicable for this article.

References

1. Weller D, Menon U, Zalounina Falborg A et al. Diagnostic routes and time intervals for patients with colorectal cancer in 10 international jurisdictions; findings from a cross-sectional study from the International Cancer Benchmarking Partnership (ICBP). BMJ Open. 2018;8(11):e023870.
2. Menon U, Vedsted P, Zalounina Falborg A et al. Time intervals and routes to diagnosis for lung cancer in 10 jurisdictions: cross-sectional study findings from the International Cancer Benchmarking Partnership (ICBP). BMJ Open. 2019;9(11):e025895.
3. Arnold A, Rutherford M, Bardot A et al. Progress in cancer survival, mortality, and incidence in seven high-income countries 1995–2014 (ICBP SURVMARK-2): a population-based study. Lancet Oncol. 2019;20(11):1493-1505.
4. Cabasag CJ, Butler J, Arnold M et al. Exploring variations in ovarian cancer survival by age and stage (ICBP SurvMark-2): A population-based study. Gynecol Oncol. 2020;157(1):234-44.
5. Araghi M, Fidler-Benaoudia M, Arnold M et al. International differences in lung cancer survival by sex, histological type and stage at diagnosis: an ICBP SURVMARK-2 Study. Thorax 2021;77(4):378-390 .
6. Araghi M, Arnold M, Rutherford MJ et al. Colon and rectal cancer survival in seven high-income countries 2010-2014: variation by age and stage at diagnosis (the ICBP SURVMARK-2 project). Gut. 2020;70(1):114-126.
7. 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(Suppl 1):S92-S107.
8. Tørring ML, Frydenberg M, Rikke PH 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(9):2187-98.
9. Redaniel MT, Martin R, Ridd MJ et al. Diagnostic Intervals and Its Association with Breast, Prostate, Lung and Colorectal Cancer Survival in England: Historical Cohort Study Using the Clinical Practice Research Datalink. PLoS ONE. 2015;10(5):e0126608.
10. Tørring ML, Murchie P, Hamilton W et al. Evidence of advanced stage colorectal cancer with longer diagnostic intervals: a pooled analysis of seven primary care cohorts comprising 11 720 patients in five countries. Br. J. Cancer. 2017;117(6):888-897.
11. Weller D, Vedsted P, Anandan C et al. An investigation of routes to cancer diagnosis in 10 international jurisdictions, as part of the International Cancer Benchmarking Partnership: survey development and implementation. BMJ Open. 2016;6(7):e009641.
12. Elliss-Brookes L, McPhail S, Ives A et al. Routes to diagnosis for cancer – determining the patient journey using multiple routine data sets. Br. J. Cancer. 2012;107(8):1220-6.
13. Rubin G, Berendsen A, Crawford SM et al. The expanding role of primary care in cancer control. Lancet Oncol. 2015;16(12):1231-72.
14. Morris M, Landon S, Reguilon I et al. Understanding the link between health systems and cancer survival: A novel methodological approach using a system-level conceptual model. J Cancer Policy 2020;25(10125):100233.
15. Greenhalgh T, Papoutsi C. Studying complexity in health services research: desperately seeking an overdue paradigm shift. BMC Med 2018;16(1):95.
16. Richards M. The National Awareness and Early Diagnosis Initiative in England: assembling the evidence. Br. J. Cancer. 2009;101(Suppl 2):S1-S4.
17. Foot C, Naylor C, Imison C. The quality of GP diagnosis and referral. [Internet]The King's Fund, London; 2010.[Accessed 21 June 2021] Available: https://www.kingsfund.org.uk/publications/improving-quality-care-general-practice

18. Richards M. Diagnostics: Recovery and Renewal - Report of the Independent Review of Diagnostic Services for NHS England. [Internet] 2020. [Accessed 2,5,11 July 2021] Available: https://www.england.nhs.uk/publication/diagnostics-recovery-and-renewal-report-of-the-independent-review-of-diagnostic-services-for-nhs-england/
19. 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(100):56-63.
20. Forbes LJ, Simon A, Warburton F et al. Differences in cancer awareness and beliefs between Australia, Canada, Denmark, Norway, Sweden and the UK (the International Cancer Benchmarking Partnership): do they contribute to differences in cancer survival? Br. J. Cancer. 2013;108(2):292-300.
21. 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.
22. 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.
23. Htun HW, EJ, Ioannides SJ et al. Investigations and referral for suspected cancer in primary care in New Zealand—A survey linked to the International Cancer Benchmarking Partnership. Eur. J. Cancer. 2017;26(3) e12634.
24. Butler J, Foot C, Bomb M et al. The International Cancer Benchmarking Partnership: An international collaboration to inform cancer policy in Australia, Canada, Denmark, Norway, Sweden and the United Kingdom. Health Policy 2013;112(1-2):148-55.
25. Weller D, Vested P, Rubin G et al. The Aarhus statement: improving design and reporting of studies on early cancer diagnosis. Br. J. Cancer. 2012;106(7):1262-7.
26. Jun GT, Ward J, Morris Z et al. Health care process modelling: which method when? Int J Qual Health Care. 2009;21(3):214-224.
27. Antonacci G, Lennox L, Barlow J et al. Process mapping in healthcare: a systematic review. BMC Health Serv. Res. 2021;21(1):342.
28. Ingeman ML, Christensen MB, Bro F et al. The Danish cancer pathway for patients with serious non-specific symptoms and signs of cancer–a cross-sectional study of patient characteristics and cancer probability. BMC Cancer. 2015;15(421).
29. Chapman D, Poirier V, Vulkan D et al. First results from five multidisciplinary diagnostic centre (MDC) projects for non-specific but concerning symptoms, possibly indicative of cancer. Br. J. Cancer. 2020;123(5):722-729.
30. Pearson C, Poirier V, Fitzgerald K et al. Cross-sectional study using primary care and cancer registration data to investigate patients with cancer presenting with non-specific symptoms. BMJ Open. 2020;10:e033008.
31. Zhou Y, Abel G, Hamilton W et al. Diagnosis of cancer as an emergency: a critical review of current evidence. Nat. Rev. Clin. Oncol. 2017;14(1):45-56.
32. McPhail S, Swann R, Johnson SA et al. (Forthcoming) Risk factors and prognostic implications of diagnosis of cancer as an emergency: An International Cancer Benchmarking Partnership (ICBP) comparative study on 857,080 patients with oesophageal, stomach, colon, rectal, liver, pancreatic, lung and ovarian cancer across 14 international jurisdictions. Lancet Oncol 2022 [Accessed 10 January 2022] Available from: https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(22)00127-9/fulltext .
33. Morris M, Seguin M, Landon S et al. Exploring the Role of Leadership in Facilitating Change to Improve Cancer Survival: An Analysis of Experiences in Seven High Income Countries in the International Cancer Benchmarking Partnership (ICBP). Int. J. Health Policy Manag. 2021; 10(107):1-11.
34. Seguin M, Morris M, McKee M et al. "There's Not Enough Bodies to Do the Demand:" An Exploration of Key Stakeholder Views on the Role of Health Service Capacity in Shaping

Cancer Outcomes in 7 International Cancer Benchmarking Partnership Countries. Int J Health Policy Manag. 2020; 9(54):1-11.
35. Nicholson BD, Goyder C, Bankhead CR et al. Responsibility for follow-up during the diagnostic process in primary care: a secondary analysis of International Cancer Benchmarking Partnership data. Br J Gen Pract. 2018;68(670):e323-e332.
36. 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(589):e508-512.
37. Bergin RJ, Whitfield K, White V et al. Optimal care pathways: A national policy to improve quality of cancer care and address inequalities in cancer outcomes. J. Cancer Policy. 2020;25(11):100245.
38. Håland E, Melby L. Keeping up with the codes; accounting for quality in cancer patient pathways (CPPs) in Norway. Eur. J. Public Health. 2019;29 (4):522.
39. Shahid S, Teng T, Bessarab D et al. Factors contributing to delayed diagnosis of cancer among Aboriginal people in Australia: a qualitative study. BMJ Open. 2016;6:e010909.
40. Vedsted P, Olesen F. A differentiated approach to referrals from general practice to support early cancer diagnosis – the Danish three-legged strategy. Br. J. Cancer. 2015;112 Suppl (Suppl 1):S65-9.
41. Pannebakker M, Mills K, Johnson J et al. Understanding implementation and usefulness of electronic clinical decision support (eCDS) for melanoma in English primary care: a qualitative investigation. BJGP open. 2019;3(1):bjgpopen18X101635.

Figures & Tables

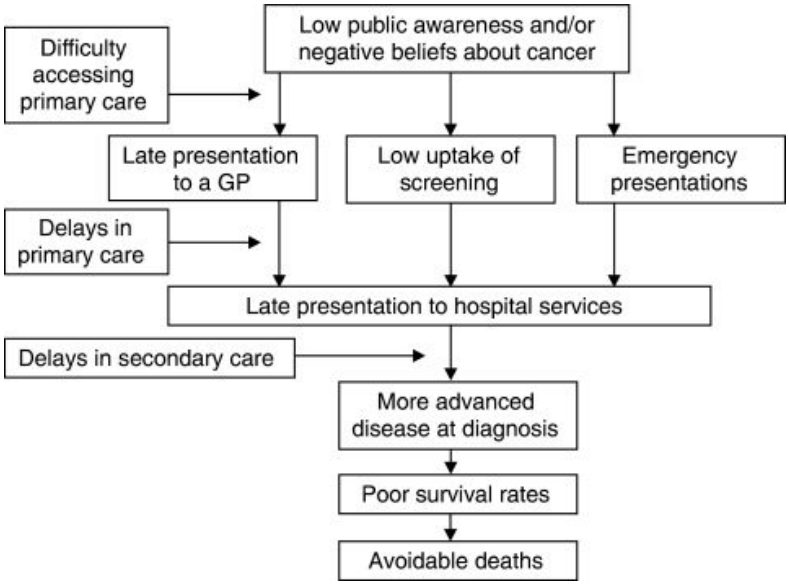

Figure 1. The National Awareness and Early Diagnosis Initiative (NAEDI) pathway (18)

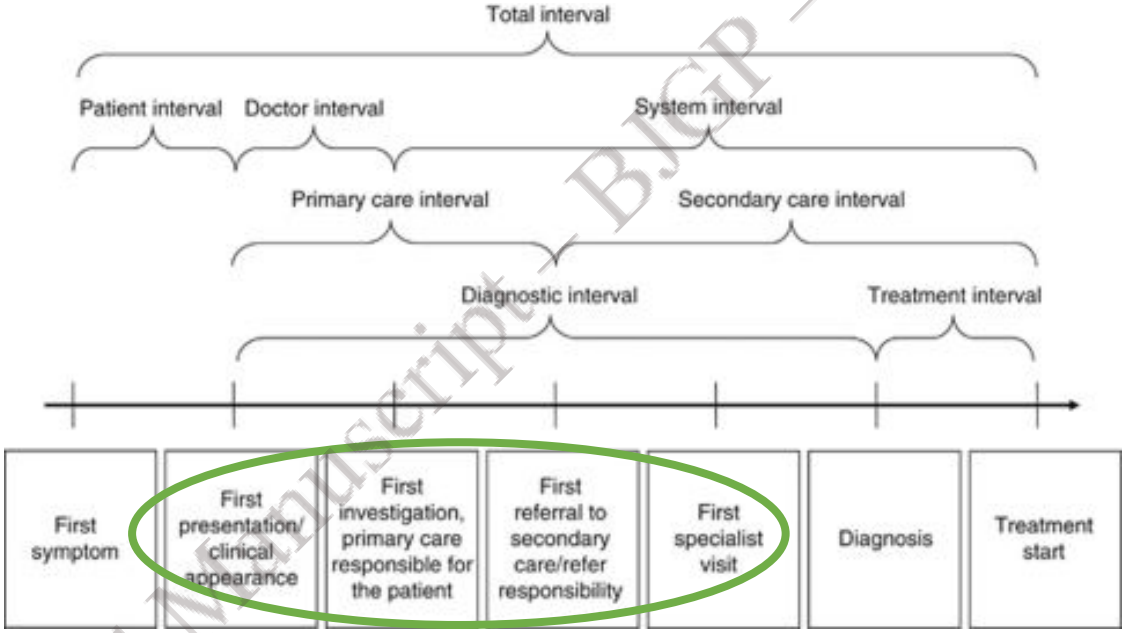

Figure 2. Edited Aarhus statement(25)

Box 1. Semi-structured questionnaire for working group members

1. Please describe the referral pathways for primary care management for suspected cancer in your country.
2. What diagnostic tests and/or investigations do primary care practitioners (PCPs) have direct access to? Is the data gathered in previous international comparisons accurate/representative, and how does this vary for different cancer sites, and across the country (3)?
3. What decision support tools and networks exist for PCPs to help them decide on how best to investigate patients with symptoms indicative of cancer? E.g. IT tools (like Qcancer (41)), secondary care support (such as specified nurse coordinators)
4. At what points when investigating patients do PCPs hand over responsibility to secondary/specialist care?
5. Are there specific processes or systems in place to avoid patients being lost from the system before a diagnosis is ruled out/confirmed (i.e., safety netting)?

Table 1. Schematic development – pathway step categories and definitions

Schematic step	PCP assessment of cancer risk and direct access investigations	Referral for further investigation[1]	Resulting action from referral
Pathway step overview	This step represents the initial PCP assessment of a patient in a primary care setting including simple tests PCPs can request or directly refer to (e.g., bloods, urine sampling, physical assessment, imaging) and referrals for secondary care investigations that PCPs can directly access, without requiring approval or referral from secondary care.	This step details what options PCPs have for referral following patient presentation of suspected cancer. This includes designated referral pathways (where available), the existence of managed routes defined by referral guidelines, and referrals to specific healthcare settings (e.g., emergency assessment, diagnostic centres). Referrals may be assigned by PCPs as urgent or standard depending upon symptom presentation.	This step encompasses the result of the PCP referral, likely occurring in secondary care. Predominantly this relates to specialist assessment of the patient, including referral for investigations. This step also captures any additional steps or decision-making points following PCP referral.
Pathway step definitions	**PCP assessment of cancer risk -** initial PCP assessment of patient including: **PCP-led investigations -** simple tests PCPs perform or refer to directly (e.g., clinical examination, urine sampling, blood tests) **PCP direct access to investigations –** PCP direct access referrals to secondary care investigations (e.g., x-ray, ultrasound)	**Standard referral to specialist:** Referral from PCP to specialist under standard procedures; not along any cancer specific or urgent referral pathways **Urgent referral to specialist:** Referral from PCP to specialist for the patient to be seen urgently; either existing as an urgent referral or via an urgent referral pathway **Referral to cancer-specific pathways:** Referral from PCP to specialist along a pathway developed specifically for patients with symptoms indicative of cancer **Access to emergency assessment:** Either PCP recommendation for the patient to attend an accident and emergency (A&E) department, or PCP requesting a specialist to see the patient on an emergency basis	**Specialist-led investigations:** Secondary care led investigations – referral, interpretation and follow up are secondary care clinician responsibility **Specialist-assessment of cancer risk:** Specialist examination and evaluation of patient with potential cancer, including interpretation of investigation results **Urgent access to investigations:** Expedited referral to diagnostic investigations/tests either from PCP or specialist; may be within standard hospital settings or in a specified diagnostic unit.

[1]Defintions for the steps in this pathway were less consistent across countries to reflect accurate practice and nuances in language used in guidance – further steps were developed during schematic development to reflect this