Claire Friedemann Smith, Alice C Tompson, Nicholas Jones, Josh Brewin, Elizabeth A Spencer, Clare R Bankhead, FD Richard Hobbs and Brian D Nicholson

Direct access cancer testing in primary care:

a systematic review of use and clinical outcomes

Abstract

Background
Direct access (DA) testing allows GPs to refer patients for investigation without consulting a specialist. The aim is to reduce waiting time for investigations and unnecessary appointments, enabling treatment to begin without delay.

Aim
To establish the proportion of patients diagnosed with cancer and other diseases through DA testing, time to diagnosis, and suitability of DA investigations.

Design and setting
Systematic review assessing the effectiveness of GP DA testing in adults.

Method
MEDLINE, Embase, and the Cochrane Library were searched. Where possible, study data were pooled and analysed quantitatively. Where this was not possible, the data are presented narratively.

Results
The authors identified 60 papers that met pre-specified inclusion criteria. Most studies were carried out in the UK and were judged to be of poor quality. The authors found no significant difference in the pooled cancer conversion rate between GP DA referrals and patients who first consulted a specialist for any test, except gastroscopy. There were also no significant differences in the proportions of patients receiving any non-cancer diagnosis. Referrals for testing were deemed appropriate in 66.4% of those coming from GPs, and in 80.9% of those from consultants; this difference was not significant. The time from referral to testing was significantly shorter for patients referred for DA tests. Patient and GP satisfaction with DA testing was consistently high.

Conclusion
GP DA testing performs as well as, and on some measures better than, consultant triaged testing on measures of disease detection, appropriateness of referrals, interval from referral to testing, and patient and GP satisfaction.

Keywords
cancer; diagnosis; diagnostic tests; health services accessibility/standards; primary care.

INTRODUCTION

In the UK, GPs have historically acted as gatekeepers to secondary care and specialist testing. Gatekeeping may cause diagnostic delay in three ways: patients may be discouraged from presenting symptoms because they suspect the GP will not take action; GPs may fail to investigate the presenting symptoms appropriately, sometimes because they have no access to the relevant diagnostic tests; and GPs may adopt, or be obligated by established clinical pathways to adopt, too high a risk threshold for referral, choosing to watch and wait inappropriately and only acting on red-flag late-stage symptoms.[1–6] 'Double gatekeeping' further lengthens delay, when a GP must first refer the patient to a specialist who reviews the patient again before requesting further investigation.[5]

Direct access (DA) testing allows GPs to refer patients for diagnostic testing without first referring to, or consulting with, a specialist.[7] It has the potential to reduce the number, cost, and inconvenience of outpatient appointments, and reduce the interval between a patient presenting to primary care and a diagnosis being reached (the diagnostic interval).[8,9] This also has the potential to allow GPs a degree of freedom in which patients they refer for investigations, providing a route to further evaluation for patients whose symptoms may not trigger examination as recommended by guideline criteria or about whom the GP has a 'gut feeling' that investigation is warranted.[10] Specialists, however, caution that capacity for secondary care investigation is limited and that DA leads to overinvestigation without increased diagnostic yield.[11] Conversely, GP reluctance to take on responsibility for investigation has been demonstrated in the contexts of knee imaging and infertility,[12,13] and GPs often fail to employ diagnostic tests for cancer despite having DA to them.[14]

The UK Department of Health invested £200m in 2012 to enhance GP access to four diagnostic tests for cancer as part of its commitment to save 10 000 lives lost due to late cancer diagnosis by 2015.[15–17] The tests chosen were non-obstetric ultrasound (ovarian cancer), flexible sigmoidoscopy (colorectal cancer), and magnetic resonance imaging (MRI) (brain cancer). It was also proposed to improve open access to chest X-rays, where there were often significant reporting delays, to expedite diagnosis of lung cancer.[15,18] In 2015, the National Institute for Health and Care Excellence (NICE) guidelines for suspected cancer recommended that GPs had direct and rapid access to laboratory tests (cancer antigen [Ca] 125, faecal occult blood testing, and full blood count), ultrasound and radiology (X-ray, computed tomography [CT], and MRI),

C Friedemann Smith, MSc, DPhil, SCAN researcher; **AC Tompson**, MSc, research officer; **N Jones**, MBBS, MClinEd, FHEA, academic clinical fellow; **J Brewin**, MBChB (Hons), honorary clinical researcher, **EA Spencer**, MMedSci, PhD, epidemiologist; **CR Bankhead**, MSc, DPhil, associate professor; **FDR Hobbs**, FRCP, FESC, FRCGP, FMedSci, professor of primary care health sciences; **BD Nicholson**, MSc, MRCGP, clinical researcher, Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford.

Address for correspondence
Claire Friedemann Smith, Nuffield Department of Primary Care Health Sciences, University of Oxford, Radcliffe Observatory Quarter, Oxford OX2 6GG, UK.

Email: claire.friedemann@phc.ox.ac.uk

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How this fits in

GP direct access testing for symptoms that could be indicative of cancer has previously been criticised for increasing testing and decreasing diagnostic yield. This systematic review did not support these concerns. No significant difference was found in the cancer conversion rate between GP direct access and specialist testing pathways. The time between test request and test performance was reduced, and GP direct access testing achieved consistently higher GP and patient satisfaction. These findings are, however, limited by poor study quality. Analysis of contemporary data is required to fully evaluate the effectiveness of direct access testing.

and endoscopy of the gastrointestinal (GI) tract for patients who do not meet the criteria for an urgent referral to a specialist, but who do have symptoms warranting urgent investigation in specific clinical scenarios.[19] At that time, a survey of GPs showed that investment was required to achieve DA to these tests across all English regions in order to reduce the intervals between request, testing, and reporting.[20] GPs reported good access to X-ray and laboratory investigations, apart from faecal occult blood testing and urine protein electrophoresis, whereas two-thirds had DA to gastroscopy, half to CT, and one-third to colonoscopy. Excluding X-ray, less than one-fifth of GPs could access radiology and endoscopy within the timescales recommended by NICE.

The authors aimed to systematically review the evidence for DA testing of adults presenting to primary care, reporting the proportion of patients diagnosed with cancer or another diagnosis (the conversion rate), and where possible the indications for testing, time to testing, appropriateness, and acceptability to GPs, specialists, and patients. Where reported, the authors include direct comparisons with outcomes in patients from the same population triaged by a specialist before testing. To the authors' knowledge, there has been no published systematic review of this type to date.

METHOD

Search

The authors registered the systematic review protocol with PROSPERO[21] and conducted a comprehensive search of the following electronic databases: MEDLINE, Embase, and the Cochrane Library. The search strategy was adapted according to the requirements of the databases (details of the search strategy are available from the authors on request). In brief, the key search terms were as follows:

- direct, open, rapid, or one-stop diagnosis or investigations;
- primary health care, general practitioner, general practice, family doctor, or specialist referral; and
- cancer, neoplasm, or carcinoma.

The authors included all study types except case studies and case series. They included adults (≥18 years) attending primary care and undergoing DA testing where cancer could be an outcome. DA testing was defined as a test that a GP could access without consulting with a specialist first. Where reported, the authors included data from 'specialist' comparator groups. These patients either underwent specialist triage, where tests requested by a GP were first screened by a specialist to determine whether the patient was appropriate for testing, or underwent specialist testing, where tests were requested by a specialist after they reviewed the patient in clinic. In addition to the database search, the reference lists of identified reviews and included studies were checked for additional papers meeting the inclusion criteria. Finally, a 'related articles' search was performed in PubMed on all included studies. No language or time limits were placed on the searches.

Data extraction

The titles and abstracts of all retrieved articles were screened independently by two reviewers and any disagreements were resolved through discussion. The full text of the remaining articles were read by two reviewers independently. Four initial screening questions were used for each paper:

1) open/DA confirmed (Y/N) — if no, exclude;
2) specialist triage of referrals (Y/N) — if yes, exclude;
3) GP DA referral outcome data reported separately? (Y/N) — if no, exclude; and
4) cancer diagnosis possible? (Y/N) — if no, exclude.

Retained studies went on to full-text review and data extraction by two independent reviewers. Data were extracted into a pre-prepared Excel spreadsheet, compared

and, if necessary, any disagreements were resolved by a third reviewer.

Quality assessment

The risk of bias and quality of the studies were assessed by two reviewers independently. Disagreements regarding the risk of bias in individual studies was resolved through discussion, with the involvement of a third reviewer if necessary. The Newcastle–Ottawa tool was used to review observational studies, and the Cochrane Risk of Bias Tool was used to assess the risk of bias in randomised controlled trials. The results of the quality assessment are used to provide an overall assessment of the quality of the included studies, and no studies were excluded on quality alone.

Analysis

The primary outcome of interest was the number of cancers diagnosed by DA or specialist testing, recorded as the absolute number and expressed as the cancer conversion rate (CR). The CR is the number of cancer cases expressed as a proportion of all patients attending DA testing. Secondary outcomes of interest were non-cancer diagnoses (with corresponding CR), indications for testing, time to diagnosis, the appropriateness of referral determined by local, national, or international guidelines, and measures of GP, specialist, and patient acceptability.

CRs were calculated for cancer and non-cancer diagnoses for each study, grouped by test type, and pooled to give a CR for each test. Pooled estimates were calculated in Stata where appropriate, using the metaprop command, weighted using the Freeman–Tukey double arcsine transformation to allow for variation in sample sizes, for: the CR of each DA test, subgroups of studies reporting DA testing in relation to a specialist comparator group, and to summarise appropriateness.[22] The Wilcoxon–Mann–Whitney test was used to investigate whether GP DA reduced the interval from referral to diagnostic test and referral to diagnosis. In addition, a narrative review of patient and GP satisfaction was conducted.

RESULTS

The PRISMA flow diagram in Figure 1 outlines the selection of the 60 studies included in the review.

Table 1 describes the papers included. There were 34 cross-sectional studies, 24 cohort studies, one randomised controlled trial, and one non-randomised trial. Gastroscopy was the most commonly studied DA test (27 studies),[23–49] followed by lower GI endoscopy (proctoscopy, flexible sigmoidoscopy, or colonoscopy, 15 studies),[50–64] CT (three studies — two head, one chest),[65–67] ultrasound (three studies — two abdominal, one gynaecological),[68–70] MRI (three studies),[71–73] X-ray (two studies),[74,75] gastroscopy and lower endoscopy combined (two studies),[76,77] mammogram (one study),[78] mammogram and ultrasound combined (one study),[79] MRI and CT combined (one study),[80,81] transvaginal sonography (one study),[82] and a range of radiological tests including MRI, CT, and barium meal (one study).[83] Fifty-seven studies (95%) reported DA testing performed in a hospital or specialist clinic setting, one utilised a DA test located in primary care,[28] and two did not specify location.[53,76]

Quality assessment

The overall quality of the studies included in this review was poor. The majority (49, 82%) of studies included a representative sample of consecutive patients. However, 39 studies (65%) demonstrated attrition of patients between inclusion and reporting outcomes without adequate explanation of the reason. Most (54, 90%) assessed patient outcomes through linked clinical records. Only one paper justified the sample size.[32] The vast majority of studies (56, 93%) presented a descriptive analysis without testing for significance between subgroups, and nine studies (15%) justified the statistical method used.

Gastroscopy

In all, 23 studies reported data allowing cancer CR to be calculated for DA gastroscopy. Indication for testing was left to the GPs' discretion in 11 (41%) studies. Five studies (19%) included only patients with dyspepsia, four required no previous gastroscopy (15%), one required no prior gastroenterological referral, one followed British Society of Gastroenterology gastroscopy guidance, and one stipulated specific alarm symptoms. (Further information is available from the authors on request.)

The cancer CR ranged from 0% to 7.2% (pooled 1.7%, 95% confidence interval [CI] = 1.2 to 2.2%) and the non-cancer CR ranged from 11.8% to 98.7% (pooled 56.9%, 95% CI = 44.1 to 69.2%). When restricted to the eight studies that included a specialist comparator group, the DA cancer CR ranged from 1.2% to 2.2% (pooled 1.6%, 95% CI = 1.3 to 1.9%), and the specialist cancer CR ranged from 1.0% to 5.1% (pooled 2.7%, 95% CI = 1.8 to 3.7%, $P = 0.03$); the DA non-cancer CR

Figure 1. PRISMA diagram: papers included in the review.

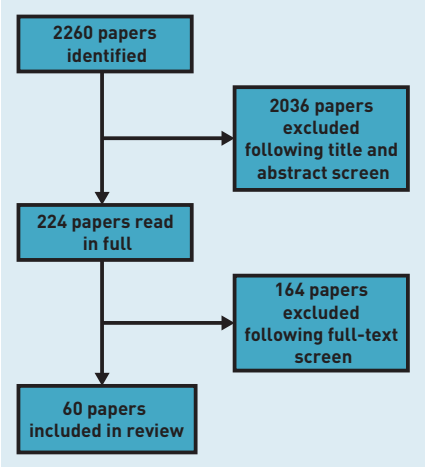

Table 1. Papers included in the review

Author, year	Country study conducted	Study design	Test(s) accessed directly	Number patients included (total, *n*)	DA group, *n*	Comparator group, *n*
Adang, 1994[23]	Netherlands	Cross-sectional	Gastroscopy	2900	1205	1695
Aljebreen, 2013[24]	Saudi Arabia	Cross-sectional	Gastroscopy	508	147	361
Apthorp, 1998[71]	UK	Cross-sectional	MRI	159	159	–
Arumugam, 2000[50]	UK	Non-randomised trial	Flexible sigmoidoscopy or barium enema	262	262	–
Balaguer, 2005[51]	Spain	Cross-sectional	Colonoscopy	350	108	242
Barton, 1987[83]	UK	Cross-sectional	Radiology	530	530	–
Basnyat, 2002[52]	UK	Cross-sectional	Flexible sigmoidoscopy	706	706	–
Boulton-Jones, 2003[25]	UK	Cross-sectional	Gastroscopy	1000	1000	–
Broe, 2013[26]	Ireland	Cross-sectional	Gastroscopy	4262	4262	–
Bytzer, 1996[27]	Denmark	Cohort	Gastroscopy	1233	1026	207
Connor, 1998[68]	UK	Cohort	Ultrasound	82	82	–
Curtin, 1992[78]	UK	Cohort	Mammography	361	361	–
de Vries, 2011[82]	Netherlands	Cohort	Transvaginal ultrasound	89	89	–
Donald, 1985[53]	UK	Cohort	Proctoscopy and sigmoidoscopy	1458	1458	–
Dougall, 2000[54]	UK	Cross-sectional	Colonoscopy	84	84	–
Froehlich, 1997[28]	Switzerland	Cross-sectional	Gastroscopy	611	472	139
Gear, 1980[29]	UK	Cross-sectional	Gastroscopy	346	346	–
Gear, 1989[30]	UK	Cross-sectional	Gastroscopy	8781	8781	–
Gimeno Garcia, 2012[55]	Spain	Cross-sectional	Colonoscopy	1004	230	774
Gough-Palmer, 2009[72]	UK	Cohort	MRI	Not stated	Not stated	–
Goy, 1986[31]	Australia	Cross-sectional	Gastroscopy	8270	1409	6861
Guldbrandt, 2014[65]	Denmark	Cohort	CT	648	648	–
Heaney, 1998[32]	UK	Cross-sectional	Gastroscopy	1872	1872	–
Hitchins, 2014[56]	UK	Cross-sectional	Colonoscopy	174	174	–
Holdstock, 1979[33]	UK	Cross-sectional	Gastroscopy	1805	1077	728
Hughes-Anderson, 2002[76]	Australia	Cohort	Gastroscopy, colonoscopy, flexible sigmoidoscopy	772	583	189
Hungin, 1987[34]	UK	Cross-sectional	Gastroscopy	94	94	–
Ingeman, 2015[69]	Denmark	Cross-sectional	Ultrasound	701	420	281
Johnston, 1999[35]	UK	Cohort	Gastroscopy	739	384	355
Jones, 1986[36]	UK	Cross-sectional	Gastroscopy	423	423	–
Kapoor, 2005[37]	UK	Cohort	Gastroscopy	3637	3637	–
Kerrigan, 1990[38]	UK	Cross-sectional	Gastroscopy	1545	1091	454
Kolk, 2002[39]	Estonia	Cross-sectional	Gastroscopy	168	168	–
Lim, 1999[74]	UK	Cohort	X-ray	603	603	–
Macintyre, 1988[40]	UK	Cross-sectional	Gastroscopy	382	382	–
MacKenzie, 2003[57]	UK	Randomised clinical trial	Flexible sigmoidoscopy and colonoscopy	1117	565	552
Mahajan, 1996[77]	US	Cohort	Gastroscopy and colonoscopy	310	168	142
Mansi, 1993[41]	Italy	Cohort	Gastroscopy	2253	1392	861
Morini, 2001[58]	Italy	Cross-sectional	Colonoscopy	1123	415	708
O'Neill, 1998[42]	Ireland	Cohort	Gastroscopy	891	891	–
Oren, 1997[43]	Israel	Cross-sectional	Gastroscopy	813	366	447
Pullens, 2014[59]	Netherlands	Cross-sectional	Flexible sigmoidoscopy	916	916	–
Rainis, 2007[60]	Israel	Cross-sectional	Colonoscopy	10 866	10 866	–
Salih, 1999[79]	UK	Cohort	Mammography and ultrasound	1698	1049	649
Salo, 2008[44]	Finland	Cross-sectional	Gastroscopy	10 061	10 061	–

... continued

Table 1 continued. Papers included in the review

Shah, 2012[45]	India	Cross-sectional	Gastroscopy	1000	1000	–
Shakil, 1995[61]	UK	Cohort	Flexible sigmoidoscopy	1090	544	546
Simpson, 2010[66]	UK	Cross-sectional	CT	4404	4404	–
Skillern, 1993[70]	UK	Cross-sectional	Ultrasound	472	472	–
Smith, 1979[75]	UK	Cross-sectional	X-ray	2409	2409	–
Suvakovic, 1997[46]	UK	Cohort	Gastroscopy	6633	Not stated	Not stated
Tate, 1988[62]	UK	Cohort	Colonoscopy	230	130	100
Taylor, 2012[73]	UK	Cohort	MRI	200	100	100
Thomas, 2010[67]	UK	Cohort	CT	215	215	–
Tiwari, 1997[47]	Saudi Arabia	Cohort	Gastroscopy	2660	1873	787
van Kerkhoven, 2007[48]	Netherlands	Cross-sectional	Gastroscopy	1298	1298	–
Vellacott, 1987[63]	UK	Cohort	Flexible sigmoidoscopy	630	630	–
Verma, 2001[64]	UK	Cohort	Flexible sigmoidoscopy	255	139	116
White, 2002[80,81]	UK	Cross-sectional	MRI and CT	366	366	–
Wong, 2000[49]	Hong Kong	Cohort	Gastroscopy	978	978	–

CT = computed tomography. DA = direct access. MRI = magnetic resonance imaging.

ranged from 50.7% to 98.7% (pooled 66.6%, 95% CI = 52.6 to 79.3%), and the specialist testing non-cancer CR ranged from 44.2% to 99.0% (pooled 63.2%, 95% CI = 51.6 to 74.0%, *P* = 0.70). (Further information is available from the authors on request.)

Large bowel endoscopy

Ten studies reported data allowing the calculation of cancer and other disease CR for large bowel endoscopy; the indication for testing was left to the GPs' discretion in five studies (50%). The remainder specified a range of age and symptom criteria, most commonly rectal bleeding, anaemia, and change in bowel habit. (Further information is available from the authors on request.)

The cancer CR ranged from 1.7% to 11.1% (pooled 4.5%, 95% CI = 3.4 to 5.7%), and the non-cancer diagnosis CR ranged from 28.8% to 62.5% (pooled 46.5%, 95% CI = 35.5% to 57.6%). When restricted to the four studies including a specialist comparator group, the DA cancer CR ranged from 3.6% to 10.8% (pooled 5.4%, 95% CI = 3.5 to 7.6%), and the specialist cancer CR ranged from 0.9% to 7.0% (pooled 3.0%, 95% CI = 1.6 to 4.6%, *P* = 0.06). The DA non-cancer CR in these four studies ranged from 40.3% to 62.5% (pooled 50.3%, 95% CI = 40.0 to 60.6%), and the specialist non-cancer CR ranged from 28.4% to 64.9% (pooled 47.5%, 95% CI = 32.0 to 63.2%, *P* = 0.77). (Further information is available from the authors on request.)

Other tests

Across the remaining 14 studies reporting data to allow the calculation of cancer and other diagnoses CR, the cancer CR ranged from 0.0% for transvaginal sonography for abnormal vaginal bleeding to 11.7% in a study reporting a wide range of DA tests used at the GPs' discretion.[82,83] The conversion rate for non-cancer diagnosis ranged from 4.2% for patients undergoing mammogram to 56.4% in a study reporting the use of DA X-ray used at GPs' discretion.[75,78] (Further information is available from the authors on request.) As there were few studies reporting each test type, and test types were heterogeneous, results were not pooled. A summary of the cancer CR and non-cancer CR for all test types is in Table 2.

Appropriateness of referral

Nine studies reported the appropriateness of test requests using guidelines from the American Society for Gastrointestinal Endoscopy,[24,58,76,77] the European Panel of the Appropriateness of Gastrointestinal Endoscopy,[51,55] the British Society of Gastroenterology,[25] NICE,[26] and previously published work.[28] Overall, there was no significant difference between the appropriateness of GP DA referrals (mean pooled appropriateness 66.4%, 95% CI = 41.2 to 87.4%) and specialist referrals (mean pooled appropriateness 80.9%, 95% CI = 73.9 to 87.1%) (*P* = 0.24).

Time to test and diagnosis

Specialist referrals resulted in a significantly longer interval between referral and testing (mean 76.6 days, SD 48.0 days) compared

Table 2. Summary of cancer and non-cancer conversion rates, all test types

Test	Number of studies, *n* (number providing data for CR calculation, *n*)	Conversion rate					
		Cancer diagnosis		Non-cancer diagnosis		All diagnosis	
		Range, %	Pooled % (95% CI)	Range, %	Pooled % (95% CI)	Range, %	Pooled % (95% CI)
Gastroscopy							
Direct access (overall)	27 (23)	0–7.2	1.7 (1.2 to 2.2)	11.8–98.7	56.9 (44.1 to 69.2)	0.7–100.0	56.1 (39.0 to 72.5)
Direct access (with comparator)	11 (8)	1.2–2.2	1.6 (1.3 to 1.9)	50.7–98.7	66.6 (52.6 to 79.3)	52.5–100.0	69.2 (53.6 to 82.9)
Specialist (comparator)		1.0–5.1	2.7 (1.8 to 3.7)	44.2–99.0	63.2 (51.6 to 74.0)	45.5–100	66.7 (54.5 to 77.9)
P-value		0.03		0.70		0.79	
Large-bowel endoscopy							
Direct access (overall)	14 (10)	1.7–11.1	4.5 (3.4 to 5.7)	28.8–62.5	46.5 (35.5 to 57.6)	1.7–67.5	40.3 (27.4 to 53.9)
Direct access (with comparator)	6 (4)	3.6–10.8	5.4 (3.5 to 7.6)	40.3–62.5	50.3 (40.0 to 60.6)	43.9–67.4	56.3 (45.4 to 66.9)
Specialist (comparator)		0.9–7.0	3.0 (1.6 to 4.6)	28.4–64.9	47.5 (32.0 to 63.2)	29.3–67.8	51.0 (34.9 to 67.0)
P-value		0.06		0.77		0.59	
MRI							
Direct access	1	1.0	–	35.0	–	36.0	–
Specialist comparator		0.0	–	27.0	–	27.0	–
Mammogram and ultrasound							
Direct access	1	1.9	–	Not reported	–	Not reported	
Specialist comparator		14.0	–	Not reported	–	Not reported	–
Abdominal ultrasound							
Direct access	2	0.0–2.4	–	32.9 (1 study)	–	32.9 (1 study)	–
Specialist comparator		0.4	–	Not reported	–	Not reported	–
CT head	2	0.5–0.9	–	8.3–10.7	–	8.8–11.6	–
X-ray (any site)	2	0.6–3.0	–	8.8–56.4	–	11.7–57.0	–
CT chest	1	3.5	–	4.6	–	8.2	–
Gynaecological ultrasound	1	0.4	–	53.4	–	53.8	–
Mammogram	1	0.3	–	4.2	–	4.4	–
MRI and CT head	1	2.7	–	46.7	–	49.6	–
Multiple radiology	1	11.7	–	55.5	–	67.2	–
Transvaginal sonography	1	0	–	32.6	–	32.6	–

CR = conversion rate. CT = computed tomography. MRI = magnetic resonance imaging.

with GP DA referrals (mean 31.9 days, SD 20.5 days) (z = 2.0, *P* = 0.03, nine studies). There was no significant difference, however, in the interval between GP DA (mean 74.0 days, SD 15.6 days) and specialist referral (mean 59.5 days, SD 21.9 days) and final diagnosis (z = –0.78, *P* = 0.44, two studies).

Patient and GP satisfaction

Three studies reported patient satisfaction with DA endoscopy and sigmoidoscopy of >90%.[52,54,56] One study reported >90% patient satisfaction with the time from referral to test and the test to receiving results, and the majority of patients felt that seeing a specialist first or receiving test results from a specialist was not necessary.[56]

Two studies reported on GPs' satisfaction with DA testing. One study reported that >90% of GPs found DA sigmoidoscopy 'useful',[33] and the other that 72% of GPs who had referred patients for DA MRI felt that it was good value for money, including 84% of those who had thought that DA MRI involved extra cost.[71]

DISCUSSION

Summary

In this systematic review, the authors aimed to summarise the current evidence for GP DA testing for symptoms related to cancer. The results show that, overall, the DA CR ranged from 0% to 12% for cancer, and 4% to 99% for non-cancer diagnoses, dependent on the type of DA

test and the indications for referral. Studies reporting a comparison between DA and patients seen by a specialist before testing showed a similar CR for both cancer and non-cancer diagnoses, and, when evaluated, no significant differences in the appropriateness of referrals.

GPs and patients reported high satisfaction with DA, with only one study reporting a higher number of GPs preferring specialist over DA referral.[52] Concerns about DA testing related to the experience of the procedure itself, for example the discomfort of endoscopy, rather than to the process of referral and testing. However, the small number of studies reporting measures of satisfaction means that these results should be viewed with caution.

DA reduced the time from GP referral to testing compared with specialist referral, and this may have contributed to the high levels of patient satisfaction reported, although no data on patient satisfaction with specialist referral were reported for comparison. Despite the reduction in time to test with DA, there was no corresponding reduction in time to diagnosis. Previous reports confirm that expedited testing does not necessarily lead to quicker diagnosis, due to waiting lists for further investigations, poor communication between specialties, and misunderstandings about who is responsible for arranging onward referral.[84]

This study provides the first overview of the literature on GP DA testing for symptoms that could represent cancer. It suggests that DA testing at the discretion of the GP may not result in a significant decrease in the proportion of patients diagnosed with cancer or other non-cancer pathology. It supports the increase in DA testing included in the UK's 2015 NICE guidelines.[85] Patients and GPs show high satisfaction with DA testing, but the results highlight the need for better-quality contemporary evidence on the optimal DA testing strategy to ensure a balance is achieved between primary care testing and disease detection.

Strengths and limitations

The authors performed a comprehensive search and applied strict selection criteria to ensure they only included studies reporting GP DA testing. They retrieved 60 studies from 15 countries, published between 1979 and 2015, making this the largest published review on DA cancer testing. However, the majority of studies were judged to be of poor quality: most were observational, without a comparator group, and using retrospective clinical record review, increasing the risk of bias and limiting the external validity of this review's findings. Reporting was of poor quality, for example a justification of the methods used was often missing, and some authors did not comprehensively report diagnoses if focusing on other outcomes, such as patient satisfaction, which could be strongly influenced by the final diagnosis.

Studies reported a range of DA tests requested for a variety of clinical indications. Deriving pooled estimates from a heterogeneous group of studies has important limitations. For example, studies with different clinical indications for testing will have varying pre-test probabilities for cancer or non-cancer diagnoses. To minimise the effect of this limitation, the authors report the indications for testing and the CRs for each study individually. They also report CR ranges in addition to pooled estimates, stratify data by test type, and report separate pooled estimates when studies report outcomes for both DA and specialist routes with the same clinical indications. Studies describing DA gastroscopy and large-bowel endoscopy dominated, particularly in relation to the appropriateness and acceptability of DA testing, and so caution is advised in the generalisation of these findings to other test types.

The use of clinical guidelines to define the appropriateness of referral may present a further limitation. Guidelines, and their underpinning evidence, vary in quality and have been criticised for oversimplifying the complexity of primary care, where undifferentiated symptoms are commonplace and are associated with both minor illness and serious disease.[86,87] However, they do provide a standard of care, to improve service delivery and health outcomes against which to evaluate clinician action.[88]

Comparison with existing literature

Two randomised controlled trials have investigated DA testing and were not included in this review as they were not investigations for cancer: MRI for knee symptoms (the DAMASK trial) and hysterosalpingography (HSG) for infertility (the OATS trial).[12,13] Both studies found no difference in waiting times and patient outcomes between DA and specialist referral routes. Uptake of DA testing, however, was low in both studies. A qualitative assessment of OATS revealed that the main barriers to the uptake of DA HSG were the infrequency of patients presenting for infertility investigation, lack of clarity over the responsibility for follow-up, and lack of support and guidance.[89] DA

tests to investigate symptoms that could indicate cancer will have greater uptake due to the higher prevalence of these symptoms in primary care, and because DA testing has been sanctioned by NICE in England and Wales, and incorporated into local referral pathways.[3]

Implications for research and practice

A common criticism of GP DA testing is that it could lead to an increase in inappropriate referrals, resulting in a decrease in the CR. This review suggests that these concerns are unsupported.[7] Cancer CRs following DA testing were notably lower than the 10–11% CR reported following analysis of urgent (2-week-wait) cancer referrals in the UK.[90,91] However, these early 2-week-wait pathways, based on the 2005 NICE guidelines,[92] were criticised for focusing on red-flag symptoms and being based on research derived from specialist care. As a result, patients with lower but not no risk symptoms were less likely to be referred urgently, experienced delays in diagnosis, and were more likely to be diagnosed with cancer as an emergency.[93,94] The move to improving access to diagnostic testing for lower-risk symptoms in the 2015 NG12 NICE guidelines was based on emerging primary care research.[95] NG12 set a referral threshold of a 3% risk of cancer, recommending combinations of clinical features for DA testing.[85] The authors' review suggests that a DA strategy may achieve a CR close to 3%, not only if the pathway entry criteria are evidence-based referral indications (similar to NG12), but also if the indication for referral is down to the GP's discretion alone. Detailed analysis of the outcomes of diagnostic pathways that have been developed in the UK to incorporate the NG12 DA criteria will greatly inform this debate, as will ongoing work on the investigations of non-specific cancer symptoms, which, at present, are less likely to be included as explicit guideline criteria.[96]

This review has re-emphasised the importance of whole-pathway redesign, and the need to focus efforts to reduce diagnostic delay on all intervals between symptomatic presentation to GP and final diagnosis: DA may be successful in reducing the time to test, but no difference was found in the total diagnostic interval.[97,98] Post-testing delays could balance out gains made by a DA strategy in the pre-test period if resources are not also invested in reducing the time between testing, reporting, definitive diagnosis, and treatment. Time spent waiting, whether for testing or treatment, has been identified as an important component in the satisfaction of cancer patients.[3,99,100] Improving the pathway to diagnosis for patients with non-specific symptoms may be achieved by national programmes in the UK, such as Accelerate Coordinate and Evaluate (ACE) and the Danish 'three-legged strategy', which are investigating the role of multidisciplinary diagnostic centre-based pathways for patients with non-specific symptoms of cancer that fall outside current urgent referral pathways.[101–103]

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