University of Strathclyde Glasgow

Final Report of the Evaluation of Rapid Cancer Diagnostic Services

December 2023

Authors

Professor Roma Maguire & Professor Robert Van Der Meer
Dr Kieren Egan
Nathan A Thompson
John Connaghan

DOI: https://doi.org/10.17868/strath.00088280

Contents

Executive Summary

The Centre for Sustainable Delivery (CfSD) commissioned the University of Strathclyde to conduct an evaluation of Scotland's Rapid Cancer Diagnostic Services (RCDS). The establishment of RCDS person-centred fast-track diagnostic pathways aims to provide primary care professionals with a new route to refer patients with non-specific symptoms, such as unexplained weight loss, pain or fatigue that may be suspicious of cancer. The implementation of the RCDS principle is timely, given that the Covid-19 pandemic has demonstrated the need for local delivery of diagnostics, where feasible, and a reduction of footfall within secondary care. The first three RCDS pathways were established in NHS Ayrshire & Arran (hereafter NHS A&A), NHS Dumfries & Galloway (hereafter NHS D&G) and NHS Fife, respectively, in spring 2021. A further two RCDS pathways were established in April 2023 in NHS Lanarkshire and NHS Borders.

This evaluation report explores three key objectives, to: (i) determine the impact of the three early adopter pathways (alongside early data from two additional sites), while providing recommendations for the wider delivery of the RCDS model across NHS Scotland; (ii) identify the optimal components of the RCDS model in NHS Scotland; and (iii) report on findings and provide recommendations to inform evidence-based decision making. Answers to these questions are underpinned by both quantitative and qualitative data collection and analysis. Data sources used to support findings include a nationally agreed minimum dataset collected by all five of the NHS Boards alongside patient and primary care surveys, respectively, developed by CfSD and administered by the five Boards. The report also discusses findings from qualitative interviews conducted by the University of Strathclyde in both 2022 and 2023 with RCDS patients and a range of healthcare professionals.

Evaluation findings and recommendations demonstrate the rapid speed at which cancer diagnoses are made across all 5 NHS Boards: the overall mean time to outcome across the five of the pathways is 16.3 days, well within the 21-day target set by the RCDSs. A number of other pertinent and favourable findings were also demonstrated including that the RCDS demonstrated both an enhanced patient experience and was satisfactory in terms of overall equity of access. There is early evidence suggesting that the RCDS is reducing pressures on primary care services and also early anecdotal evidence of improved clinical outcomes for patients. Presentation of 'unexpected lab results,' 'GP gut feeling' and 'nausea/appetite loss' on referral and cognitive impairment as a co-morbidity were suggestive of a positive correlation with cancer incidence (see Table 2). CT scanning plays a prominent role in the diagnostic process (see Figure 16).

The health economic evaluation of the first RCDS pathways (NHS A&A, NHS D&G, NHS Fife) consisted of a detailed analysis of the average per-patient cost of managing and running each pathway, in addition to the average time from referral to RCDS outcome in each pathway. Patients were assumed to derive a utility gain from a faster time to RCDS outcome, which implies a reduced period of uncertainty and potential anxiety. Overall, this evaluation found RCDS pathways to be cost-effective when compared to general surgery pathways for patients with vague and complex symptoms: any cost differentials tended to be outweighed by patient utility gains from a faster time to diagnosis. This finding is in line with the main conclusion of the study by Sewell et al. (2020) on the cost effectiveness of the pilot Rapid Diagnosis Centre (RDC) in Swansea Bay University Health Board (SBUHB) in Wales.

On the other hand, a direct comparison of costs and timings of RCDS with a GP Direct Access pathway is currently problematic. Any comparison of RCDS with a pathway in which the organisation and management of the diagnostic work-up falls on the GP rather than a wider team of specialist RCDS staff, would have to rely on several key assumptions that need to be underpinned by further in-depth research. First, the frequency of any tests (including CT scans) requested for patients may, or may not, be similar between the pathways: a possible assumption is that GPs may request more CT scans than RCDS teams. Second, the quality of diagnostic decision making may, or may not, differ significantly between the pathways: a possible assumption is that, in the absence of a specialist RCDS team, a GP

Direct Access pathway may lead to unwarranted delays for some hard-to-diagnose patients. A solution that is both clinically effective and cost effective could involve running RCDS pathways and GP Direct Access pathways side-by-side (in addition to the site-specific pathways) provided that primary care physicians are guided to make referral choices that are optimal for each pathway.

Optimal components of the RCDS model in NHS Scotland include: (i) Vetting and triage by the RCDS team, (ii) Personalised and single point of contact provided for each patient by a designated RCDS team member from the point of referral, (iii) Coordinated testing, including close liaison with the Radiology department, (iv) Diagnostic decision making by the RCDS team and MDT and (v) Appropriate onward referrals by the RCDS team for patients with an initial diagnosis or suspicion of cancer to a specialist cancer pathway. While there is good evidence to suggest that the RCDS pathways are effectively embedded in each of the 5 Health Boards, there is scope for further development. These include the implementation of primary care decision support tools to help healthcare professionals recognise potential signs and symptoms of cancer, and the use of longer-term follow-up procedures for RCDS patients not diagnosed with cancer or a specific non-cancer condition.

While there are many strengths of this work included in the wide range of quantitative and qualitative data sources, it is also important to recognise limitations. This includes our evaluation lacking systemic (e.g., minimum dataset) information regarding decision making at the primary care level alongside information regarding longer term outcomes and impacts on patients (both cancer and non-cancer diagnosis). It should also be noted that whilst our qualitative interviews with patients and professionals included all 5 health boards, some boards had greater representation than others.

Our evaluation raises the need for continuous learning of these new pathways and approaches (should pilot approaches be delivered long term) including through the evaluation of longitudinal clinical follow up at the individual patient level.

What are Rapid Cancer Diagnostic Services?

The Centre for Sustainable Delivery (CfSD) commissioned the University of Strathclyde following competitive procurement to evaluate Scotland's Rapid Cancer Diagnostic Services (RCDS) – previously known as Early Cancer Diagnostic Centres (ECDC). The first three RCDS pathways were set up in Spring 2021:

- NHS A&A;
- NHS D&G;
- NHS Fife.

A further two RCDS pathways were established in April 2023, and these are located in:

- NHS Lanarkshire;
- NHS Borders.

Prior to the establishment of the RCDS pathways, patients who do not meet the Scottish Referral Guidelines for Suspected Cancer criteria or who present with non-specific but concerning symptoms, could cause their primary care clinician concern, especially if the latter's 'gut instinct' is of a malignancy. In such cases, primary care would have to coordinate a number of diagnostic tests, while retaining full clinical responsibility for the patient, or choose to refer to a single cancer speciality that may not be the most appropriate. This process can result in delayed diagnosis, onward referrals to multiple specialties, as well as unnecessary or inconclusive examinations with resulting poorer patient experience and outcomes.

The establishment of RCDS person-centred fast-track diagnostic pathways aims to provide primary care with an alternative route to refer patients with non-specific symptoms, such as weight loss,

fatigue and nausea that can be suspicious of cancer. Similar Rapid Diagnostic Centres (RDCs) have been set up, with compelling evidence, in Denmark, England and Wales in recent years e.g., (Dolly et al., 2020) and (Næser et al., 2017). The initial implementation of the RCDS's was timely, given that the Covid-19 pandemic has demonstrated the need for local delivery of diagnostics, where feasible, and a reduction of footfall within secondary care. Lengthening waiting lists and backlogs for urgent and routine patients across a number of specialties, caused by the COVID-19 pandemic, added to the urgency of this new referral pathway. The RCDS pathways aim to ensure that those identified as higher risk of cancer are expedited into the appropriate system, so that they receive the required treatment and care earlier than would otherwise have been feasible.

In line with the Scottish Government's previous National Cancer Plan (2020-2023) – *Recovery & Redesign: An Action Plan for Cancer Services*, (Scottish Government, 2020) three early-adopter RCDS pathways were established Spring 2021. The high-profile nature of this work required independent evaluation to enable adaptive evidence-based policy decision-making, which can help to inform wider roll-out. The policy commitment already exists in regards to introducing RCDS pathways across NHS Scotland, to ensure equitable access (*A Fairer, Greener Scotland: Programme for Government 2021-22)* (Scottish Government, 2021). In light of this, it is important to understand the best model or most effective components of a RCDS. This will help ensure that all patients, regardless of where they are referred in to a RCDS pathway, receive consistently high-quality care. While all five Boards to date have adopted different pathways, they all embed the nationally agreed RCDS key principles, as agreed by the RCDS Oversight Group (Chaired by NHS D&G's Chief Executive Jeff Ace), as follows:

- Excellent patient coordination and support with patients having an assigned 'navigator' throughout their diagnostic pathway alongside access to accurate resources, to inform decision-making.
- Early identification of patients that meet RCDS referral criteria, with timely referral to the service and a suite of preliminary tests completed.
- Prompt Active Clinical Referral Triage (ACRT) undertaken.
- Coordinated testing, based on the patient's needs in a 'one-stop' environment where possible, with live or rapid reporting, shortening the diagnostic pathway.
- Earlier diagnosis of cancer, or other condition(s), shared appropriately with the patient and the outcome speedily communicated back to primary care along with next steps.
- Appropriate onward referral for further support, treatment, or care.
- Adoption of the principles of Realistic Medicine throughout.

Boards with a RCDS are:

- **NHS A&A** has established a virtual RCDS. The Board works towards a 21-day model, from referral to communication of results to the patient. Referrals went live on 21 June 2021 in one GP cluster with the remaining clusters coming on stream by the end of August 2021. The Board opened to referrals from their Combined Assessment Unit (CAU) in November 2021. The RCDS Clinical Lead is a Consultant Haematologist.
- **NHS D&G** has established a 7-day pathway (from referral to communication of results to the patient) with 'hot' clinics and 'hot' reporting. Referrals went live on 17 May 2021, adopting a phased approach by GP clusters. For year 1 of the pilot the RCDS Clinical Lead was a Consultant Haematologist but from September 2022 onwards the Clinical lead has been the GP Lead for Cancer and Palliative Care.
- **NHS Fife** is working towards a 21-day pathway (from referral to communication of results to the patient). Referrals went live on 7 June 2021. The RCDS has a Consultant Colorectal Surgeon as Clinical Lead but is now a nurse-lead service. The Board is now expanding learning from their RCDS into gastro-intestinal cancer pathways (UGI and colorectal).

- **NHS Lanarkshire** is working towards a 21-day pathway from referral to communication of results. Referrals went live on 24 April 2023 with a Consultant Colorectal Surgeon as Clinical Lead.
- **NHS Borders** is working towards a 21-day pathway with a GP as Clinical Lead and referrals going live from 10 April 2023.

In all RCDS pathways, patients can be referred by primary care professional staff with the main aim of diagnosing non-specific symptoms that are suspicious of cancer and do not meet eligibility criteria of site-specific pathways. Patients can also be redirected from site specific pathways if they meet RCDS criteria. Furthermore, in one out of the five RCDS pathways, primary care has direct access to diagnostic CT scanning for non-specific symptoms.

In each of the pathways, patients will have an initial set of tests (which may differ somewhat between the pathways) via primary care, prior to referral to the RCDS. At this point, patients should also be offered access to a nationally agreed resource to provide them with information on the RCDS that was developed in collaboration with the third sector and patient representatives. Patient referrals are then vetted for pathway suitability and either accepted into the RCDS, redirected to another service or back to the primary care clinician. Patients accepted onto the RCDS pathway will be contacted within 48 hours of receipt of referrals and will have further diagnostic tests (normally including a CT scan) to determine a final outcome (cancer, non-cancer, no diagnosis) and will be redirected at the completion of that stage. Models of delivery of the pathway vary between virtual and in person clinics, and all have an associated Multi-Disciplinary Team (MDT) of healthcare professionals to support clinical decision making. There are also differences with regard to the precise nature of the patient contact between the five RCDS pathways, although all have a navigator to support them from the point of referral.

Evaluating the RCDSs

Study Objectives

The objectives of the overall evaluation of RCDS over the commissioned period of two years were to:

- Determine the impact of the three early adopter pathways (alongside early data from two additional sites), while providing recommendations for the wider delivery of the RCDS model across NHS Scotland;
- Identify the optimal components of the RCDS model in NHS Scotland;
- Report on findings and provide recommendations to inform evidence-based decision making.

An interim report based on the first year of the three early adopter services running was produced in November 2022 (Maguire et al, 2022). This final report will provide: an update of the nationally agreed minimum datasets collected by each of the three early-adopter Boards, as well as the minimum datasets provided by the two new Boards; summaries of CfSD patient and professional surveys; results from the cost effectiveness analysis; and patient and professional experiences & perceptions of RCDS to date.

Study Setting

The final evaluation took place within NHS A&A, NHS D&G, NHS Fife, NHS Lanarkshire, and NHS Borders.

Study Design

The evaluation adopted a concurrent mixed methods approach informed by a realistic evaluation framework (Pawson & Tilley, 1997) that questions 'what works, for whom, in what respects, to what extent, in what contexts and how?'.

Study Methods

User Surveys (CfSD Evaluation)

All patients that moved through a RCDS pathway in Scotland, were given the opportunity to complete a questionnaire that was developed by the national RCDS Oversight Group.

Primary Care Professional Survey

A link was issued to all GP practices in the Health Boards with a RCDS, via Lead Cancer GPs, with everyone encouraged to participate in the survey - both those that have referred patients to a RCDS and those that have not. It was launched in April 2022 and carried out again in August 2023. Aggregated results are included in this report from both the patient and professional surveys across the five RCDS pathways and qualitative results removed to avoid the possible identification of any participants.

Qualitative interviews

Qualitative interviews were conducted with patients, primary care professionals and secondary care professionals involved in the RCDS pathway at all five Health Boards.

Health Economic Evaluation

For each of the three early adopter boards, both the RCDS pathway and an agreed comparator pathway were modelled using discrete-event-simulation (DES) software. Key pathway activities were modelled together with associated timings, resources, and costs (and associated uncertainties).

Assigning quality-of-life measures to simulated patients at the relevant stages of the pathway enables for an assessment to be made of additional costs associated with RCDS regarding assumed wellness benefits of receiving an early diagnosis. The assumed by quality-of-life indices are illustrated in Table 1.

Table 1: Assumed Quality-of-life indices, (Moseholm et al, 2016)

Health State	Quality-of-life index
During pre-diagnosis stage (<2 months wait)	0.62
During pre-diagnosis stage (>2 months wait)	0.428
Post-diagnosis (cancer)	0.639
Post-diagnosis (other)	0.664

It is important to note that the evaluation does not consider quality-of-life benefits due to improved outcomes, since linkage data was not available to allow for this at this stage. Rather, the quality-of-life benefits considered are phycological benefits associated with the receipt of an earlier diagnosis and improved patient pathway experience, as in (Sewell et al., 2020).

Also, in the absence of alternate local pathways which feature patients that could be considered from the same target population as RCDS patients, the evaluation considers the assumed journey of RCDS patients had they been referred to the identified comparator. Since the comparators are different for each of the NHS boards, comparisons between the NHS boards in terms of cost-effectiveness are not useful.

Due to NHS Ayrshire & Arran having existing data for a pre-existing GP Direct Access pathway, the comparison to the RCDS pathway was made to their GP Direct Access pathway. However, such a pathway does not currently exist at NHS Dumfries & Galloway or NHS Fife, which instead were

theoretically modelled as what would be assumed to happen to the RCDS patients had they gone through their local general surgery pathway at each NHS board.

Simulations were run for a 2-year period, this period was chosen to reflect the approximate length of time that the early adopter sites have been running.

Analysis of RCDS Minimum Data Sets

Analysis of RCDS minimum datasets from all five NHS Boards to date was conducted. The quantitative analysis includes the following key measures that are aggregated across all pathways:

- RCDS referral rates;
- RCDS referral decisions;
- Number of RCDS patients over time;
- RCDS patient outcomes;
- Cancer types diagnosed;
- Diagnostic tests performed;
- RCDS patients by gender (cancer and non-cancer);
- RCDS patients by age (cancer and non-cancer);
- RCDS patients by clinical frailty score (cancer and non-cancer);
- RCDS patients ECOG performance score (cancer and non-cancer);
- Presenting symptoms (cancer and non-cancer);
- Comorbidities (cancer and non-cancer);
- Onward referral destinations.

Results

Qualitative Interviews, Focus Groups and Smart Survey

Sample Patient and Professional Interviews

A total of 22 professional staff participated in interviews and 1 focus group was convened in the 2nd year of the evaluation. Analysis from the 10 professional staff interviewed in year 1 can be found in the interim report (Maguire et al, 2022). For patients, a total of 32 interviews were conducted, with 8 interviews conducted in year 1 and 24 conducted in year 2.

Table 2: Characteristics of patient sample (left) and professional sample (right)

Diagnosis	**n**		**Ethnicity**	**n**
Non-Cancer	32		White Scottish	24
Cancer	0		Other White British	6
			Other White	1
			N/A	1
Age group	n		**Deprivation Score***	**n**
45 to 54	1		2	7
55 to 64	7		3	9
65 to 74	13		4	10
75 to 84	9		5	5
85+	2		n/a	1
Gender	n		**Experience****	**n**
Man / Male	12		7	1
Woman / Female	20		8	2
			9	3
			10	26

Role	**n**		**Ethnicity**	**n**
Health Professional	17		White Scottish	21
Administrative/ support roles	2		White Irish	1
Managerial	3			
Age group	**N**		**Experience in role**	**n**
25 to 34	6		Up to 1 year	6
35 to 44	6		Up to 2 years	4
45 to 54	6		Up to 5 years	6
55 to 64	4		10 Years+	6
Gender	**n**			
Man / Male	6			
Woman / Female	16			

**Carstairs deprivation quintiles 1-most deprived, 5-least deprived. ** Experience of RCDS pathway 1-very bad, 10-excellent.*

Sample Smart Survey

Patients: A total of 601 patients who had used the RCDS pathway completed the patient survey over years 1 and 2, although not all patients completed all parts. Where patients had to complete sections at home following discharge from the RCDS, completion rates dropped.

Professionals: In year 1 a total of 50 primary care professionals completed the professional survey across the 3 Health Boards. In year 2, a total of 143 primary care professionals completed the professional survey across 5 Boards. As above, individual response levels to questions vary. Some professionals are likely to have completed the survey on both occasions.

Key Results

Patient and Professional Perceptions of the RCDS

The results of patient and professional interviews and focus groups are presented in two parts: 1) the various components involved in the delivery of the pathway and 2) evaluation of the outcomes and impact of the RCDS.

Delivery of the RCDS

Resources required to deliver a RCDS

Uncertainty about future funding of RCDS
The amount of funding in kind and "giving time" at present may not be sustainable
Minimum data set incorporated into host IT infrastructure

The evaluation explored key stakeholder's perceptions of the funding for the RCDS for the initial pilot and beyond. In interviews with health professionals whilst there was a lot of support for the service to continue, there still remained uncertainty about how it would be funded in the future. Most could see the value in the pathway and hoped that it would become incorporated into business as usual and would be funded by the local Health Board: *'I think no one doubts the value of the pathway. And I suppose the value, and affording are two different matters'* (Prof 18). Linked to the funding and implementation of the pathway there was a recognition that for the pilots there was a certain amount of funding 'in kind' from primary and secondary care. How this was going to be funded and sustained beyond the pilots was questioned. Relative to resources there was also some discussion about the IT systems that would be required to host the RCDS dataset and how there would be a requirement for them to be provided by the host organisation.

Referral to RCDS

Overall quality of referrals into the RCDS is 'reasonable' but GP awareness of criteria is crucial in optimising the pathway and reducing inappropriate referrals
Consistent level of missing data, often relating to blood bundles and weight
At the point of referral, some patients are not aware that they have been referred to a Rapid Cancer Diagnostic Service

For all sites the main source of referrals is primary care. However, at one site, secondary care can also refer patients to the RCDS. During the interviews and focus groups, professionals spoke about the referral pathway. Their overall perception was that the quality of the referrals from primary care were *'reasonable'* (Prof 2). However, there did appear to be '*a sort of consistent level of missing data' (Prof 3)* often related to missing blood bundles and weight*: '… it surprises you when someone is referred in with unexpected weight loss and there is no weight recorded…'* (Prof 3). The appropriateness of referrals was also discussed. While most GPs seem to be aware of the criteria, it was still apparent from the RCDS teams that inappropriate referrals were being received. Poor quality referrals were referenced against those that should have been progressed along a site-specific pathway and being instigated by locums working in general practice. Such findings sit along with the results of the primary care professional survey that whilst reporting a high level of familiarity with the referral criteria, 31% of primary care professionals reported that they had referrals redirected. The importance of ensuring that services referring to the RCDS were fully aware of the criteria to optimise referrals was discussed as were the various approaches used by each Board to increase awareness. This included GP leads running sessions with primary care clusters, newsletters and making resources available that could be accessed at any time.

In terms of the patient perceptions of the referral process, there were various reasons highlighted by patients as to why the situation had reached a state of urgency for investigation including the presence of symptoms over several weeks/months. A challenge mentioned by numerous patients was that gaining rapid access to professionals such as GPs remained difficult. Furthermore, initial explanations/introductions of the RCDS at the primary care level appeared to vary considerably. Some patients indicated that they did not fully understand that they had been referred to a cancer pathway: *I got quite a shock when I realised, as I say, that's what it was…*' (Patient 10). Others described a conversation about the cancer referral being a mutual agreement with the clinician.

RCDS patient engagement on the pathway

Having a single point of contact is perceived by patients and professionals to be an optimal component of the RCDS
Having both virtual and face to face options (i.e., a hybrid model) appear to support patient preference and accessibility

When a patient is referred on to the RCDS they are contacted either by a patient navigator/ admin staff, or the clinical nurse specialist '*just to let them know about the pathway, give them some information.'* (Prof 20). This person was often the main point of contact for the patient throughout the RCDS. Interviews with professionals highlighted the importance of this first contact particularly as some patients are not aware that they are on a cancer pathway. The majority of patients expressed similar perceptions of the benefits of having a main point of contact for the duration of their time on the RCDS.

In terms of delivery of the RCDS, there was differentiation in the sites relative to whether patients accessed the service face-to-face or virtually. One RCDS offers a one stop clinic. The benefit of the design of the service being *'…you've got that ability to get the patient seen and diagnosed in a day. That's something the other sites don't have.'* (Prof 17). However, the difficulty of face-to-face appointments for some patients who may have to travel quite a distance to attend was acknowledged. *We're 40 miles away from [hospital]...the nurse…said some people prefer to go home and come back in the sort of afternoon. That wasn't practical for us.' (Patient 30).* Face-to-face clinics also appeared to limit the number of patients that can be seen. For sites that offer a virtual/hybrid pathway, there appeared to be the option to bring patients into a clinic if there were accessibility issues.

Relative to patient acceptance of the four Health Boards that delivered the RCDS using a hybrid/virtual model, professionals perceived this to be well received*: 'I think the telephone assessment does work well for the majority of patients.'* (Prof 14). Similarly, all sites offer the option of informing patients of their results over a telephone call, so that they can be informed more rapidly, although for more serious results the patient would be seen face-to-face. Such perceptions regarding virtual delivery were also supported during the patient interviews: *'it was more than adequate, the phone call, in my opinion.'* (Patient 1).

Role of Radiology in the Delivery of the RCDS

Radiology plays a core role in the delivery of the RCDS and having dedicated slots supports the rapidity of the pathway

The role radiology plays in the pathways was highlighted as fundamental to their successful delivery by several participants. '*…this doesn't work without radiology at all steps with their team being on board and they've been great.'* (Prof 7). All sites mentioned the provision of dedicated slots from Radiology for CT scans and the importance this played in the rapidity of the RCDS. The patient experience also highlighted the core role that radiology played in patient's satisfaction with the service. Many patients commented that the quick turnaround of the RCDS process was unexpected, including when compared to previous healthcare use. This expedited pathway both '*alleviates fear*' and gives people a chance to have treatment quicker than they normally would.

The MDT

The MDT is considered an important component of the RCDS particularly for complex cases requiring further investigation

All sites have a MDT meeting to discuss all the diagnostic results and next steps for each patient. The makeup of the MDT generally includes one lead clinician and the core RCDS team but varies by site. All sites noted the importance of having systems in place to ensure efficient tracking and running of the pathway up to and beyond the MDT meeting. The types of cases featuring in MDT meetings were discussed. For one MDT, discussion mostly focused on complex benign cases: *'…they're not clear-cut ones...There's like 50 things in the CT scan, what do you do with this patient?'* (Prof 7). The specialist input the MDT provides compared to GP Direct Access to CT was highlighted: *'…I think that's the benefit of the MDT group…we've got really good brains working behind to pick up on lots of other things…lots of non-cancer diagnoses which have massive impact on patient management as well. And that is lost with the CT CAP route'* (Prof 4). For those diagnosed with cancer, it was also highlighted that not all patients would pass through the MDT if it was a clear-cut case *'…it's not going to change what we would do anyway…'* Cancer cases brought to the MDT were ones that generally required further investigations. One site also discussed how the MDT was seen as being part of the learning process of the RCDS*: 'That is our MDT and that's what our MDT consists of, having those discussions about complex patients, rare patients…It's a learning opportunity'* (Prof 18).

Post-RCDS pathway for patient

Many patients express relief at a non-cancer diagnosis but may still be experiencing symptoms once discharged back to their GP practice and it is not always clear from a patient perspective what should happen next.
The post RCDS experience for patients was variable and often dependent upon both whether a specific diagnosis is made alongside the extent of unresolved symptoms.
While some patients do see resolution to symptoms there remain barriers to follow-up care including lack of access to primary care physicians alongside long waiting times for specialist referrals.
RCDS can use the opportunity to promote positive lifestyle changes to patients before discharge back to primary care.

In terms of onward referral after involvement in the RCDS, for those patients with a definitive cancer diagnosis this process appeared to be relatively straight forward. Many patients highlighted that the RCDS outcome to rule out cancer made a difference to their overall wellbeing: *'…that puts your mind at rest, and you know you feel better that they've gone through everything that they've gone through...'* (Patient 13). In terms of the rapidity of services following a non-cancer diagnosis and discharge, it was recognised by staff working in the RCDS that once patients had finished on the pathway and re-entered conventional routes, waiting times could increase. This view was echoed by patients who were referred on to other specialist pathways. While some patients mentioned positive experiences, many patients found the adjustment from RCDS to the post RCDS care frustrating. Further, several patients found communication channels particularly difficult to navigate when compared to that of RCDS. Professionals working in the RCDS spoke about how this transition could be enhanced by having good relationships with the onward services. Another professional spoke of how they tried to ensure that they provided relevant and comprehensive information to optimise the onward referral process from RCDS. The importance of this transition was further elaborated on by a professional who spoke about how they were in the process of developing a process map for this part

of the pathway to fit: *'with how that speciality wants to receive a referral, or how that specialty wants you to ask them for the advice and so forth.'* (Prof 10).

Professionals were also asked about their perceptions of the RCDS when patients were discharged back to their GP. There was a recognition that for some patients, whilst maybe expressing relief at not having a cancer diagnosis, they were still experiencing the presenting symptoms: '*They're left thinking, well, what is going on, why haven't you given me an answer?*' (Prof 16). This was a view shared by many patients. It was also apparent that some RCDS pathways used the opportunity before discharging patients back to their GP to promote positive lifestyle changes that in turn may have an impact on the presenting symptoms: '*And if it's not been suggested at the time of triage, say "How would you feel about a referral to the dietician"? Or you know, "you weren't keen on help to quit smoking…have you had second thoughts about that"'* (Prof 3). One site had formally introduced a lifestyle medicine clinic to offer to patients who are discharged back to primary care: '*The nurse on the results call will offer if they would be interested in just talking to someone about small, very small changes that can be made across 4 areas of their health over which they have control. Eat, sleep, move, relax...It's a solution focused approach that we are taking with this. So, it is completely led by the patient…They'll get a lifestyle medicine prescription, the offer of a follow up appointment if they would like one…'* (Prof 19).

Outcomes and Impact of the RCDS

Enhanced patient experience

There is evidence that the RCDS results in an enhanced patient experience.
Positive patient experience appears to be mainly attributed to the speed of referral, reduction in waiting times for diagnostic tests, having a single point of contact and enhanced information and communication throughout the pathway.

- Smart Survey data demonstrated that over 96% of responding patients rated the service as 8 or more out of 10.
- Approximately 94% responded positively when asked about the level of care provided by the medical staff working together,
- 99% felt they were treated with dignity and compassion during their time under the RCDS's care*:*

'Yeah. The pathway experience was in sharp contrast to everything else...to have that little diamond in the middle, where you really felt held and cared for, you know, that somebody was on it.' (Patient 31).

Several factors in the RCDS have been highlighted as contributing to this:

Increased and better-quality communication with the patient during the pathway compared to other services. This can be attributed to the single point of contact that is provided to patients when they start the pathway, either by a pathway navigator or a clinical nurse. The quality of information provided and the availability of these professionals relative to any queries that the patient may have provide reassurance to the patients. This quality of communication was evidenced both in patient interviews and the Smart Survey responses.

- Almost 98% of survey respondents feeling that they could ask questions or get more information as needed while under the RCDS's care.

- 92% knew of a named contact that could provide this information.
- 90% who tried to contact their named contact found it easy to do.
- 94% of respondents reported that they were given clear information about next steps.
- 94% said the results of their tests were explained in a clear way by the RCDS team.

The speed at which patients move through the pathway and the reduction in time worrying about test results, appeared to greatly enhance the patient experience.

- 88% of survey respondents agreed that their referral to RCDS helped them understand the cause of symptoms more quickly.
- 94% felt that the time taken to complete the tests was "about right".

Such findings are encouraging in terms of the value of the RCDS pathway from a patient perspective. However, it should be noted that these findings may not always equate to symptom resolution, which is a key challenge highlighted within patient interviews in terms of onward referral.

Enhanced professional experience and satisfaction

Professionals delivering the RCDS report high levels of satisfaction with the service

Professionals involved in the RCDS who were interviewed expressed high levels of satisfaction with the service, both in terms of the positive impact it had for patients, and the opportunity for experiential learning that it provided them*: 'I like that I'm making a positive difference for patients…You know, there's more to it than just sticking them through the scanner and then telling them what it is - there's real subtleties to what's going on with some of them and by having more like a 30-minute clinic rather than a 10-minute GP appointment, I'm able to get in a bit more depth as well. So, I'm finding it professionally very engaging and satisfying as well, because I've got that bit more time with people and I feel like we're kind of getting to the root of what's going on.'* (Prof 21).

Such positive experiences were also reflected in the survey data. During both years 1 and 2, the feedback indicated that GPs generally had a favourable view of the service with

- >85% in year 1, and 84% in year 2 reporting a rating of 4 or more (out of 5) for overall RCDS experience.
- <10% of respondents in year 1, and <8% in year 2 reported to having any dissatisfaction in any of the following aspects: ease of making referrals, undertaking pre-clinic tests, patient outcomes, patient outcome waiting times and GP/RCDS communication.

Pathway successfully adopted in local area

There is evidence to suggest that the RCDS pathways are successfully being embedded in each Health Board and serving a common purpose

Some in the early adopter Boards feel the RCDS is so well embedded, that a return to the situation prior to RCDS would be challenging. Referrals are coming in from a broad selection of GPs however there still appears to be some practices that are not using the service and it would be of interest to find out why they don't use it, e.g., lack of awareness or that they don't have patients who meet the referral criteria. Those GPs who use the service, rate it highly and continue to use it.

There was some initial scepticism about RCDS from some in secondary care, particularly around what impact it might have on their patients. *'…given the same resource what can I do for people with dysphagia, for instance…There was an element of, could this resource be used in another way to greater advantage' (*Prof 2). However, there was also a perception among some of those involved in RCDS that once the service was up and running, the benefits of it would become more apparent to secondary care. This has generally been the case *'…we're becoming more well known within the hospital. So yeah, I do think it, it is a positive service, and most people are on board with it.* (Prof 20)*; '…you can see consistently, you know, secondary care specialties, you know, putting referrals back to the GP with recommendations to refer back to RCDS. So, it's supported by you know your surrounding clinicians as well. And the other specialities that they feel they don't meet their specific pathway, so we're meeting a gap that's obviously clear there.'* (Prof 10).

Overall Impact of RCDS

RCDS appears to be operating under more favourable conditions than cancer specific pathways
Overall equity of access to the RCDS appears to be satisfactory.
Early indications of improved outcomes and reduced pressures on primary care

In terms of RCDS in comparison to other cancer specific pathways, there was the view that RCDS was operating under more favourable conditions. There was also the recognition that RCDS patients can be seen quicker than other cancer pathway patients, and that decisions about which patients get seen sooner are difficult. Equally there was also the view that RCDS was operating at a level other cancer specific pathway should be adopting to provide equitable care*: 'yeah, if everybody could work like that, it would be, you know more equal for everyone…' (*Prof 17).

In terms of equity of access for patients from deprived areas and ethnic/minority groups, some RCDS professionals perceived that they did not discriminate against anyone referred to them. For example, any potential gatekeeping regarding equity of access could be more related to behaviours/actions around: patient help seeking, attendance at arranged appointments and subsequent likelihood of onwards referral where required*: '…people just have to go and see their GP and then the GP has equity of access. I can't influence the decision making of the GP beyond saying this exists, please think about it. And it would fall to someone other than myself in a sort of a public health sense to prompt the patient from the deprived area to consult with the GP in the first place.'* (Prof 21).

However, there was also an acknowledgment that it was part of the RCDS team's role to ensure distinct groups were being equitably served by their RCDS, and measures were taken to ensure that distinct groups could access the service. For instance, for patients for whom English was not their first language, interpreter services could be made available. Likewise with other groups with hearing deficits or additional barriers to communication, face-to-face appointments could be arranged.

There was also some discussion relating to whether the geography of Health Boards had an impact on access to the RCDS. Some health professionals perceived that equity was not an issue in terms of the geography of their Boards and it was thought to occur at the GP level rather than being due to particular areas: '*It's a good spread. No, there's a good spread across the county. There are some GP's who are more frequent referrers.'* (Prof 3). Others recognised that geographic spread could be an issue for patients that lived further away from the main hospitals of the Health Board where diagnostic tests are delivered.

Patient follow-up data and cancer staging data is not routinely collected as part of the current minimum datasets. As such, it is not yet possible to infer improved outcomes as a result of earlier diagnosis. However, a few professionals commented on how the RCDS could lead to improved clinical outcomes such as picking up conditions faster. Furthermore, the primary care survey reported that, following a patient having cancer ruled out, 52% of primary care professionals reported seeing their patient less than before (31% said it was difficult to answer or they didn't know), suggesting that their RCDS referral and resulting decision helped provide reassurance. Furthermore, some anecdotal evidence from interviews with primary care professionals also indicates that the RCDS is saving time for GP practices.

Quantitative Analysis and Modelling

Analysis of the RCDS Minimum Datasets

Each of the five participating NHS Boards collect RCDS data according to a pre-agreed minimum dataset. This dataset allows for inferences of pathway performance and other useful associations and trends. The data to the time of writing (October 2023) consists of data from the five NHS Boards, each contributing differing proportions which are illustrated in Figure 1.

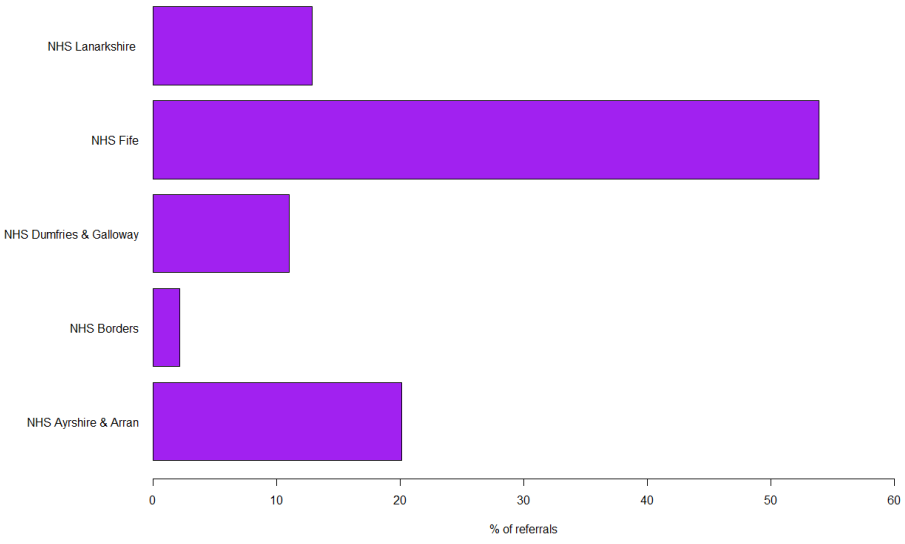

Figure 1: RCDS patients (%) across the five participating NHS Boards

RCDS referrals

The total number of referrals in the combined dataset was 3616, predominantly referred by primary care (98.9%). Figure 2 illustrates the referral rate (per 100,000 people) to a RCDS at each of the five Boards (calculated using region populations). The rate appears to be higher at NHS Fife in comparison to the other Boards, which appear consistent with each other. NHS A&A and NHS Fife display a noticeable increasing trend as time has gone by since commencement.

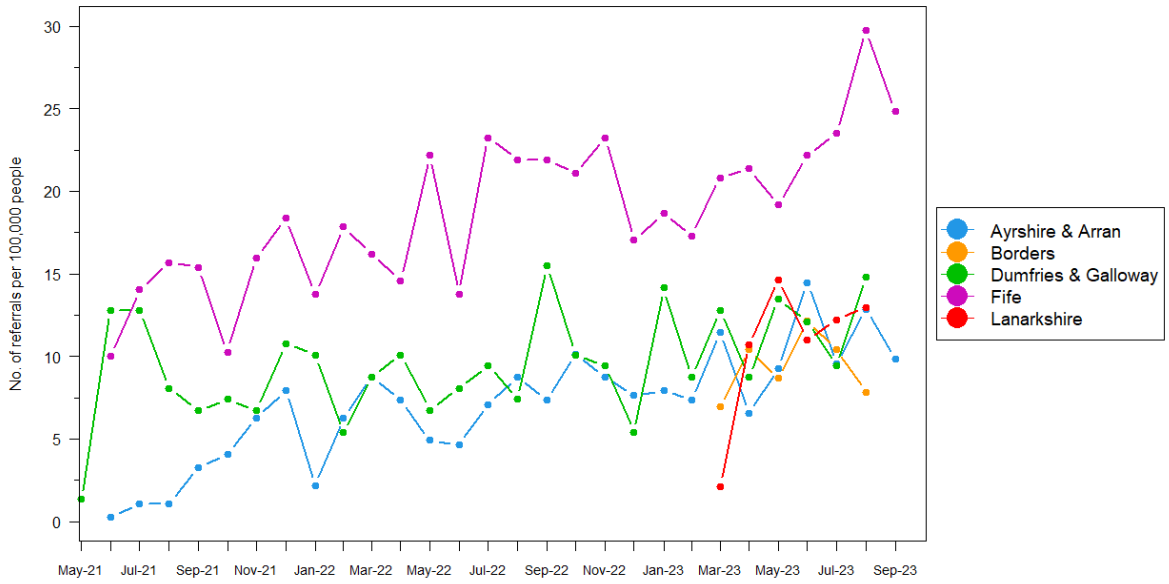

Figure 2: Referrals, per 100,000 people, to RCDS per month since commencement of the services, across all Boards

RCDS referral decisions

Overall, 2489 (~69%) patients were accepted onto the pathway. This is illustrated in Figure 3, with the most common reasons for not being accepted being that the patient either did not meet RCDS referral criteria or that they met the criteria for a site-specific pathway, as per the Scottish Referral Guidelines for Suspected Cancer.

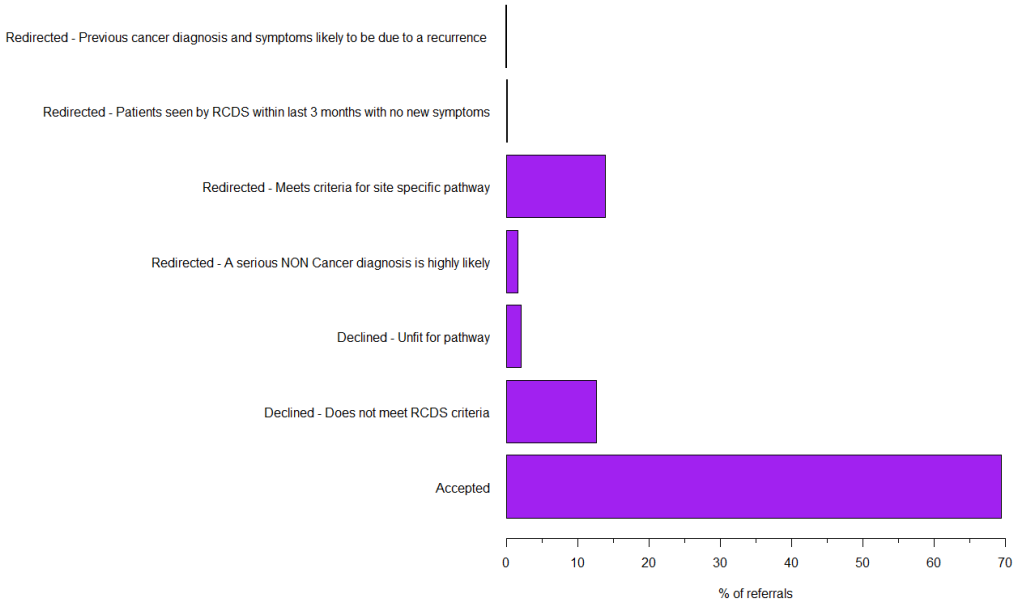

Figure 3: RCDS pathway referral decisions across all Boards

The differences between the acceptance rates at each Board can be observed in Figure 4. The three early adopter sites show similar acceptance rates, suggesting consistency in decision making. The acceptance rates at the two new adopters are currently higher, particularly at NHS Borders, however

this is based on a relatively low sample size due to the pathway both still being in its infancy and covering a relatively low catchment population. It is expected that the acceptance rate may take time to settle as RCDS becomes embedded and it will be interesting to see if these accpetance rates settle to similar rates to the early adopters in time.

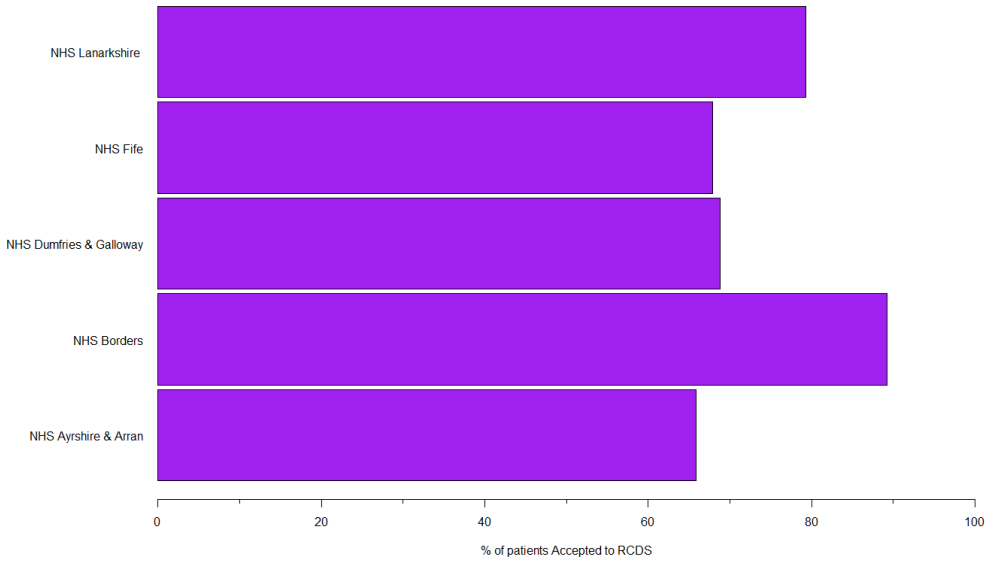

Figure 4: RCDS pathway acceptance by Board

RCDS patient gender split

The overall gender split across the five Boards for RCDS patients (those accepted onto the pathway) is ~58.5% female to 41.5% male. The higher proportion of female patients is consistent across all five Boards, as illustrated in Figure 5, with all being close to the overall average.

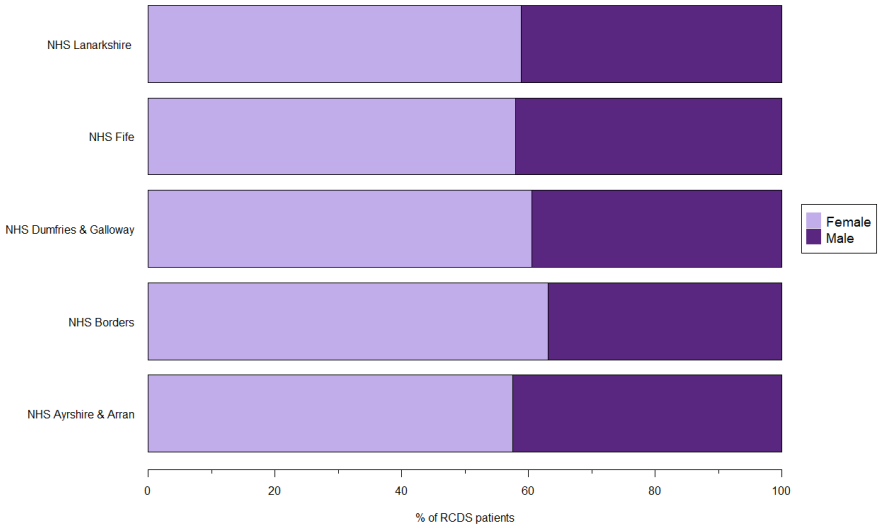

Figure 5: RCDS patient gender split (%) at each NHS Board

Regarding cancer incidence, Figure 6 shows that the gender split is similar when comparing patients that went on to be diagnosed with cancer compared to those not found to have cancer.

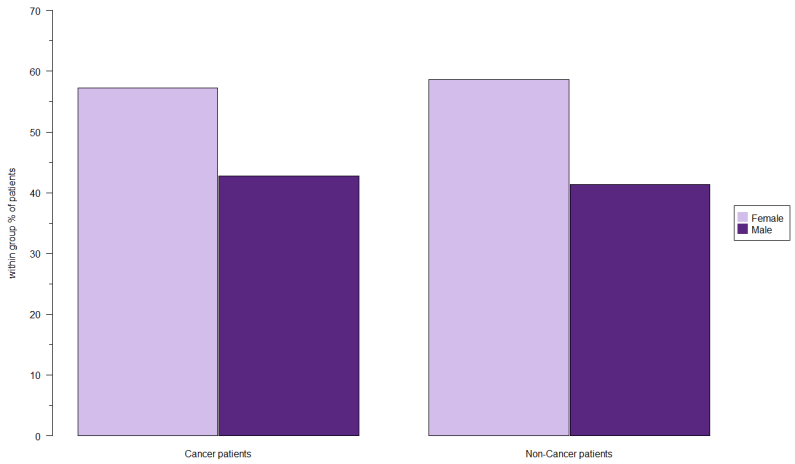

Figure 6: Gender split (%) of RCDS patients, grouped by Cancer incidence

RCDS age distribution

Figure 7 illustrates the overall distribution of ages of RCDS patients, with the distribution being left skewed (i.e., a longer left tail) with a mean age of ~68 years, median of 70 years (IQR 60-78).

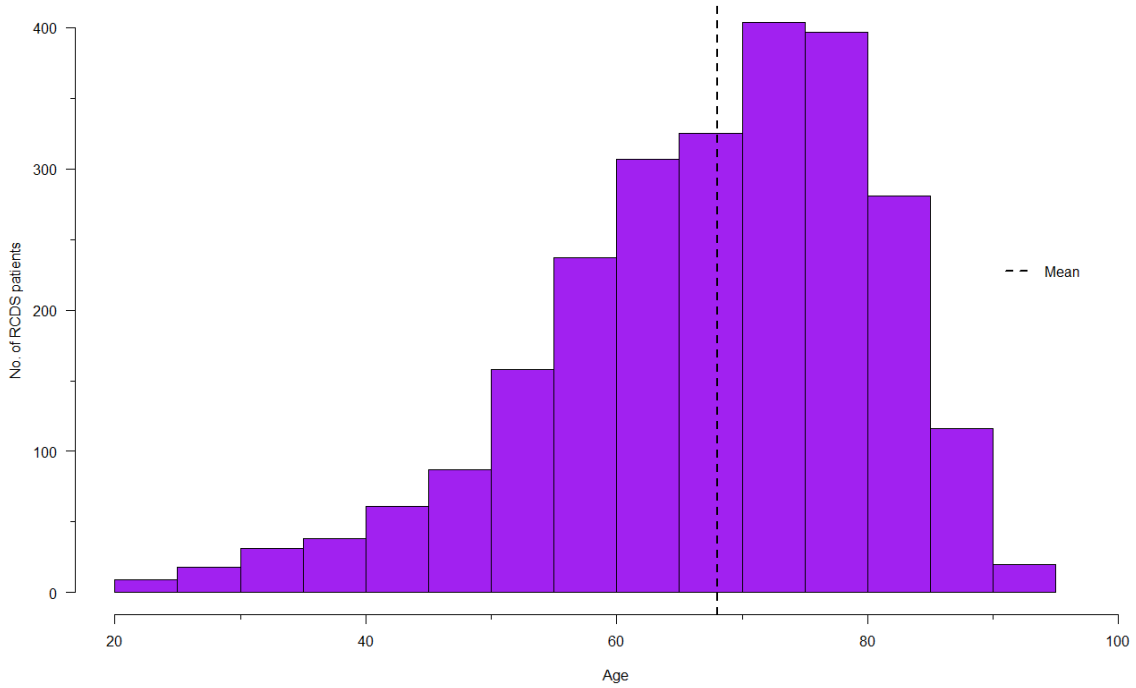

Figure 7: Age distribution of RCDS patients

Figure 8 illustrates the difference in the spread of ages in the cancer group compared to the patients not having cancer, with younger patients being less common in cancer patients.

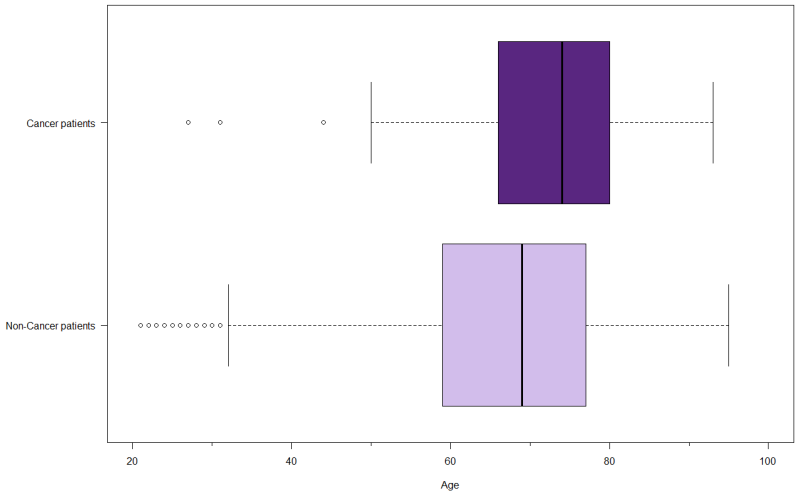

Figure 8: Age of RCDS patients, by cancer incidence

RCDS patient performance scores

The minimum datasets recorded both clinical frailty scores and Eastern Cooperative Oncology Group (ECOG) performance status as measures of patient health. Both are illustrated by cancer incidence in Figure 9 and Figure 10.

Clinical frailty scores for RCDS patients are distributed plausibly symmetrically with a modal score of 4. Cancer patients tend to exhibit higher proportions of patients with scores greater than 4 in comparison to patients not found to have cancer.

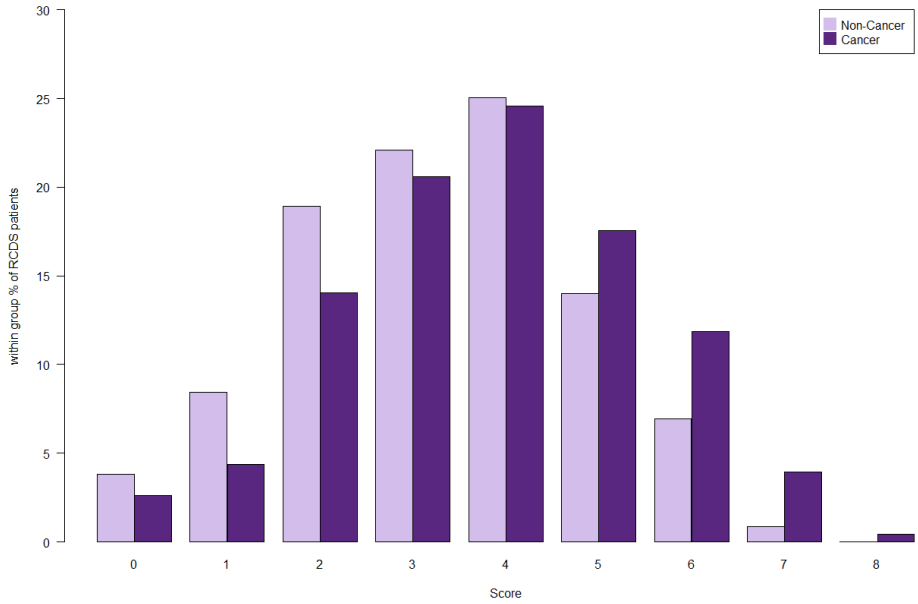

Figure 9: RCDS patients clinical frailty scores (%), grouped by cancer incidence, where level 0 = 'very fit' and level 8 = 'living with severe frailty'

ECOG performance scores of RCDS patients show a general decreasing trend from 0 to 4. As with Clinical Frailty Scores, higher ECOG scores tend to have higher proportions of cancer patients in comparison to patients not found to have cancer.

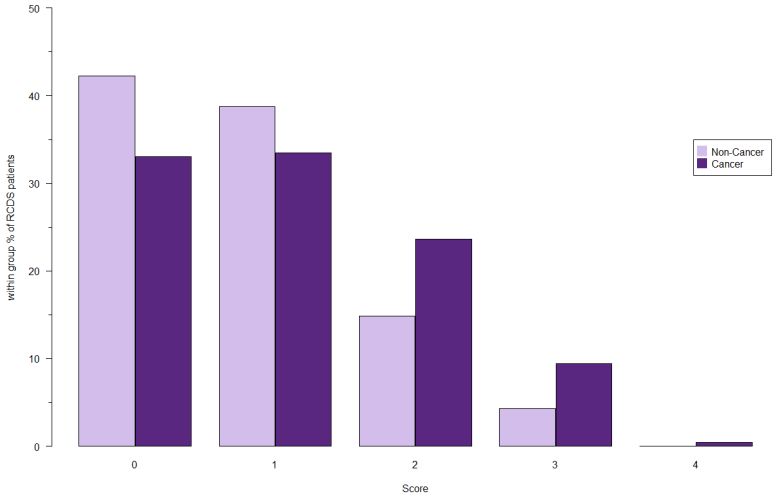

Figure 10: RCDS patient ECOG performance scores (%), grouped by cancer incidence, where 0='Fully active' and 4 = 'Completely disabled'

Frequency and type of symptoms

Figure 11 illustrates the frequency of the presenting symptoms of RCDS patients. Unexplained weight-loss is the symptom most common among RCDS referrals and is similarly common to both cancer patients and patients not found to have cancer. 'GP-gut feeling' and 'new unexplained laboratory results' are both noticeably more common to cancer diagnosed patients.

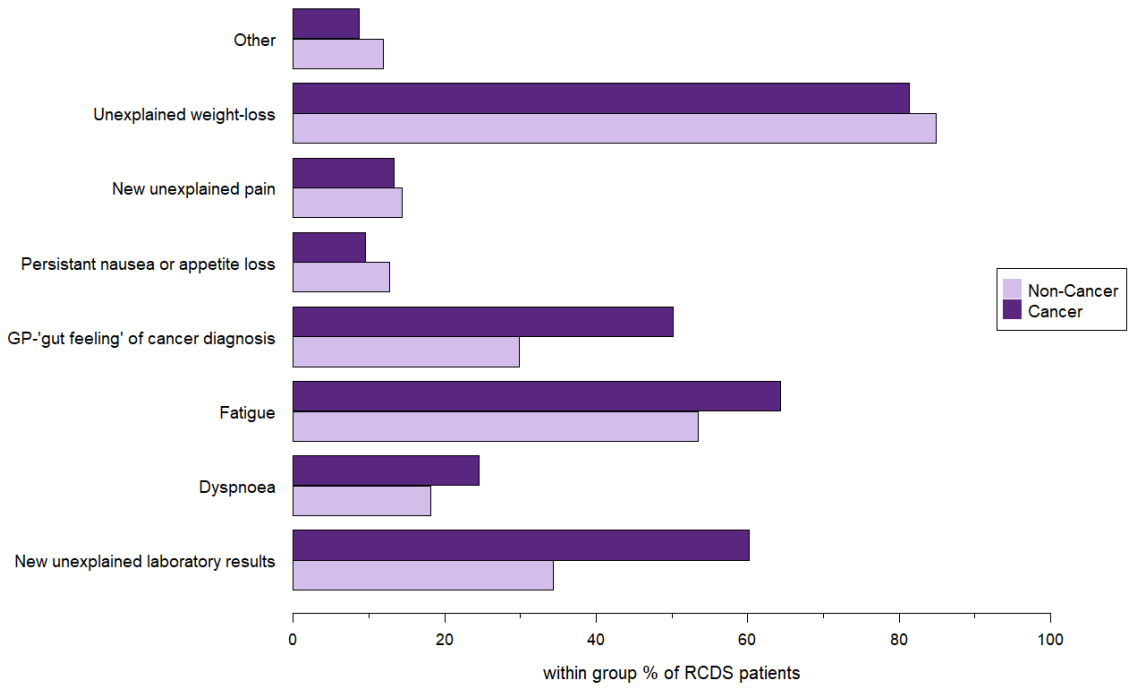

Figure 11: Symptoms of RCDS patients, grouped by Cancer incidence

Number and type of comorbidities

Figure 12 illustrates comorbidities found among RCDS patients. The comorbidities are found to be varied, with patients commonly having comorbidities that do not fall into the pre-determined groupings (i.e., the 'other' group). It is also relatively common for RCDS patients not to have any comorbidities. There is no obvious association of any one comorbidity to cancer incidence.

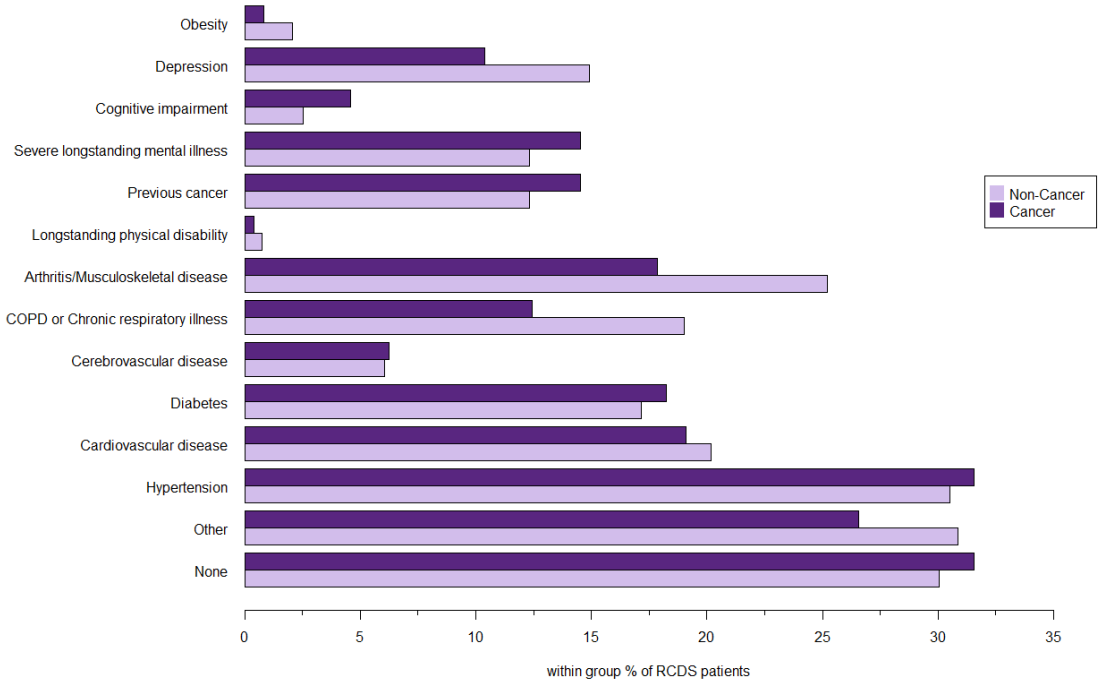

Figure 12: Comorbidities of RCDS patients, grouped by cancer incidence

Summary statistics for cancer patients compared to patients not diagnosed with cancer, as well as the overall figures, are given in Table 3. The table also indicates the statistical significance of each factor with regards to cancer incidence.

*Table 3: Summary statistics of RCDS patients overall, grouped by cancer incidence. Featuring logistic regression multivariable statistical test for significance, where * denotes statistical significance.*

	Overall[+]	Cancer patients	Non-Cancer patients	**Log Odds Ratio (95% CI)**
Gender *female %*	58.5	57.3	58.6	1.10(0.83-1.46)
Age *mean, median (IQR)*	68.1, 70 (60-78)	72.3, 74 (66-80)	67.3, 69 (59-77)	1.03*(1.01-1.04)
Clinical Frailty Score *mean, median (IQR)*	3.8, 3 (2-4)	3.8, 4 (3-5)	3.3, 3 (2-4)	1.11(0.97-1.26)
ECOG score *mean, median (IQR)*	0.8, 1 (0-1)	1.1, 1 (0-1)	0.8, 1 (0-1)	1.13(0.92-1.40)
No. of symptoms (%)				
0	0.17	0	0.2	
1	18.1	10.3	19.2	
2	26.8	20.1	27.6	
3 or more	55.0	69.6	53.0	
Symptom *(%)*				
Unexpected Lab results	35.4	60.2	34.4	2.91* (2.18-3.89)
Dyspnoea	19.4	24.5	18.1	0.96 (0.68-1.36)
Fatigue	54.5	64.3	53.4	1.27 (0.92-1.74)
GP gut feeling	33.1	50.2	29.8	1.95* (1.44-2.64)
Nausea/appetite loss	10.8	9.5	12.7	1.67* (1.02-2.72)
Pain	13.9	13.3	14.4	1.15 (0.76-1.72)
Unexplained Weight loss	82.6	81.3	84.9	0.98 (0.68-1.39)
Other	10.4	8.7	11.8	1.46 (0.87-2.44)
No. of comorbidities (%)				
0	13.1	11.0	13.4	
1	22.7	21.2	22.9	
2	24.8	29.7	24.1	
3 or more	39.4	38.1	39.6	
Comorbidity *(%)*				
Obesity	1.6	0.8	2.1	0.51 (0.12-2.16)
Depression	12.7	10.4	14.9	0.82 (0.53-1.28)
Cognitive impairment	2.4	4.6	2.5	2.16* (1.10-4.26)
Mental illness	1.8	1.2	2.0	0.80 (0.24-2.62)
Previous cancer	11.5	14.5	12.3	1.35 (0.91-1.98)
Physical disability	0.6	0.4	0.8	0.90 (0.12-6.96)
Arthritis/musculoskeletal disease	21.3	17.8	25.2	0.82 (0.58-1.17)
COPD or Chronic respiratory illness	16.5	12.4	19.0	0.75 (0.50-1.12)
Cerebrovascular disease	5.6	6.2	6.1	1.07 (0.61-1.88)
Diabetes	15.1	18.3	17.2	1.28 (0.90-1.83)
Cardiovascular disease	17.8	19.1	20.2	1.10 (0.78-1.56)
Hypertension	27.2	31.5	30.5	1.24 (0.93-1.67)
Other	28.2	26.6	30.8	0.97 (0.71-1.32)
None	25.8	31.5	30.0	1.42 (1.05-1.93)

[+] the 'overall' column includes cases for which the diagnosis was unknown (i.e., N/A value)

Of patient characteristics, age is found to be positively correlated with cancer incidence. The referral symptoms 'unexpected lab results,' 'GP gut feeling' and 'nausea/appetite loss' are found to be positively correlated to cancer incidence, cognitive impairment was the only co-morbidity suggestive of a positive correlation with cancer incidence. Such findings could be useful to assist optimise referral decisions.

The significance of 'unexpected lab results' with regards to cancer incidence highlights the importance of ensuring that the initial suite of tests is completed at referral. This was often found not to be the case at each of the Boards, with patients needing to be directed back to the GP to ensure that they are completed.

It is worth noting that some inconsistencies exist within the minimal datasets with regards to reporting of patient symptoms, in particular dyspnoea is specifically categorised at NHS Fife and NHS Borders, but not at the other Boards. There are also inconsistencies in how pain is categorised at NHS Fife and NHS Borders in comparison to the other three boards.

Frequency of testing

Figure 13 illustrates the frequency of diagnostics given as part of the RCDS pathway. As expected, CT scanning plays a prominent role.

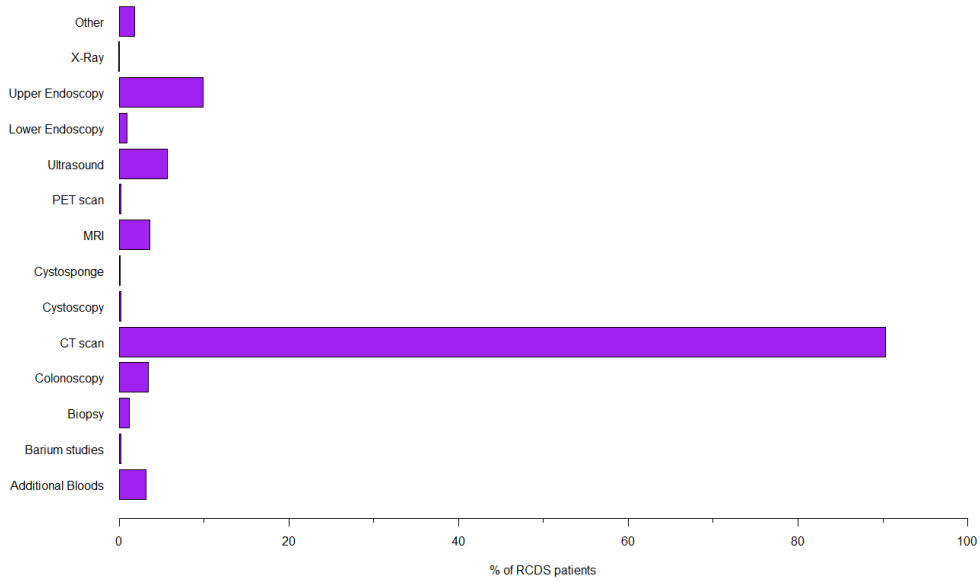

Figure 13: Frequency of diagnostic tests for RCDS patients (%)

RCDS cancer diagnosis

Figure 14 illustrates the overall diagnosis frequencies for RCDS patients across all Boards. The overall cancer incidence rate is 11.9%, with pre-cancer found in 6.4% of cases, a non-cancer diagnosis given to 40.7% of patients, and no diagnosis given in 41.1% of cases.

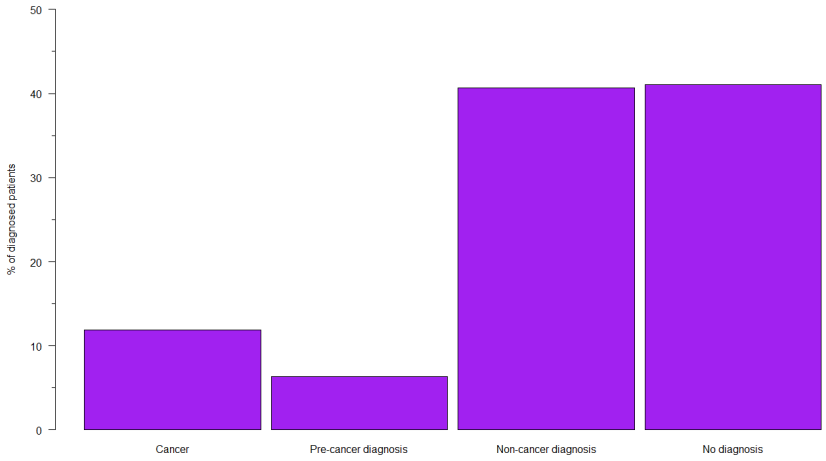

Figure 14: Overall RCDS diagnosis (%)

Figure 15 provides a diagnosis breakdown at NHS Board level. The cancer incidence rate varies between ~6%-~18% across the five Boards. The proportion of non-cancer diagnoses at NHS Lanarkshire is noticeably higher in comparison to the other RCDS adaptors. Likewise, the proportion of patients receiving 'No diagnosis' is noticeably higher than in other Boards.

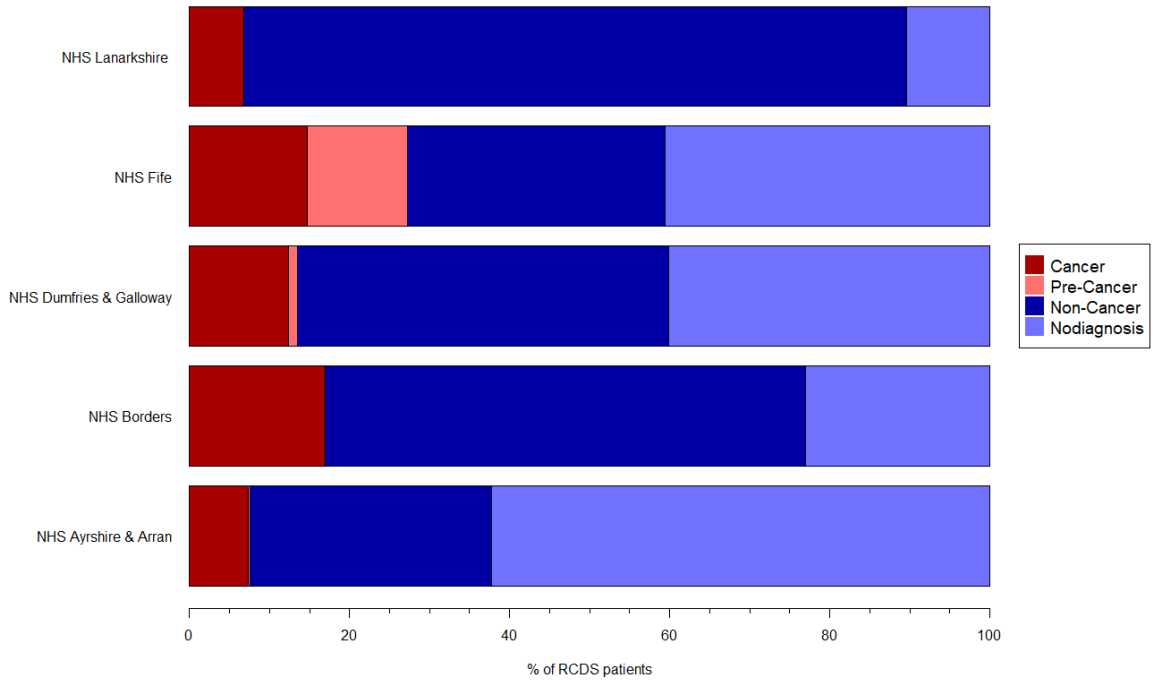

Figure 15: RCDS Diagnosis splits (%) at NHS board level

Type of cancer diagnosed by RCDS

Figure 16 illustrates the cancer types diagnosed by the RCDS. It shows a wide range which is broadly similar to those found in literature for analogous pathways. Both lung and HPB are the two most commonly found so far.

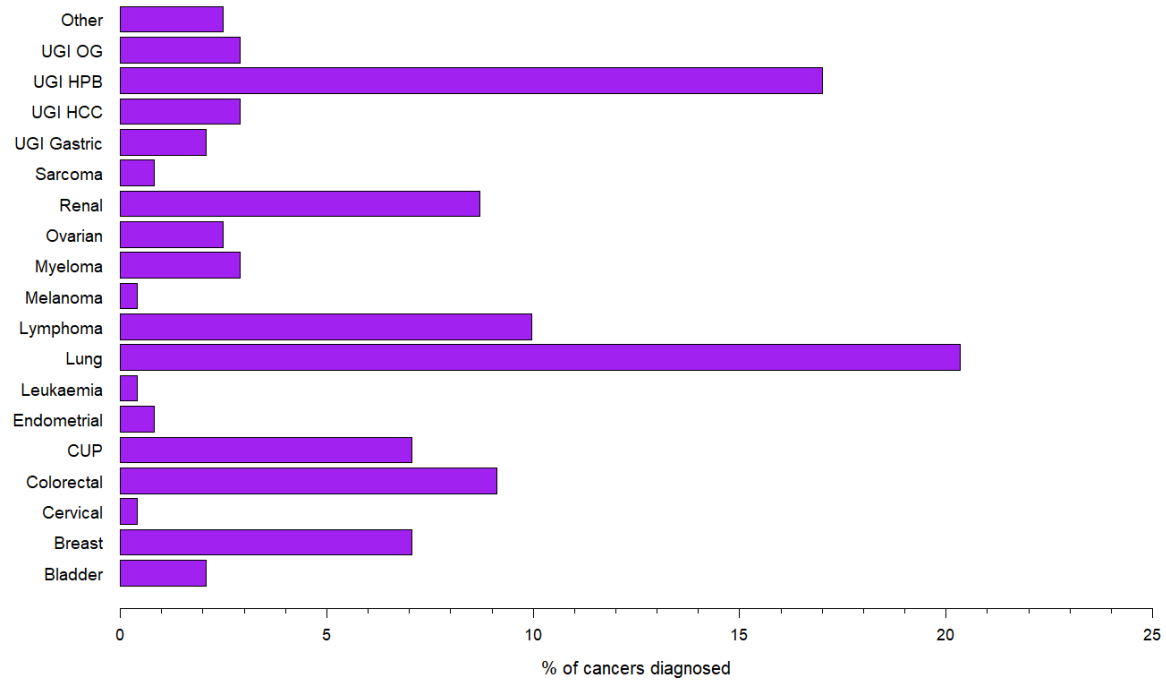

Figure 16: Cancer types of RCDS patients

Onward destinations of RCDS non-cancer patients

Figure 17 illustrates the onward destinations of RCDS patients not diagnosed with cancer (i.e., those in receipt of a 'non-cancer diagnosis' and 'no diagnosis'. The vast majority are directed back to primary care.

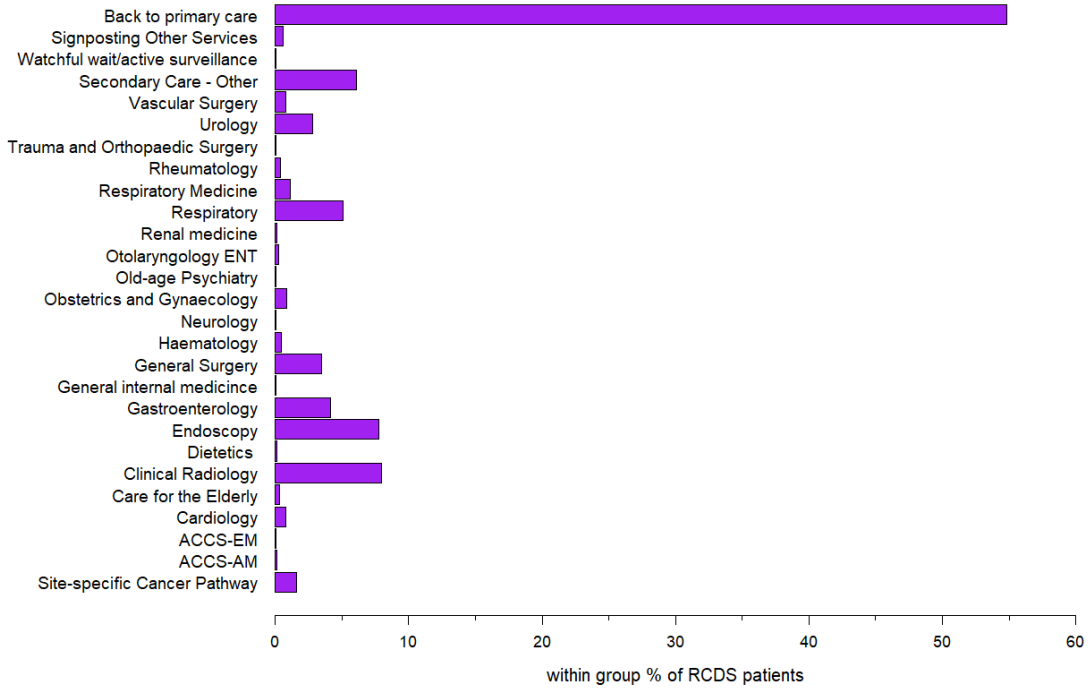

Figure 17: Onward destinations of non-cancer patients

Pathway timings: time to RCDS vetting

Figure 18 illustrates the spread of time taken from referral to patient vetting across the five RCDS pathways. Although variation exists between the spreads, the median time appears very similar across all five pathways. The mean time to vetting across all pathways is 1.5 days, median 1 day, and IQR 0-2 days.

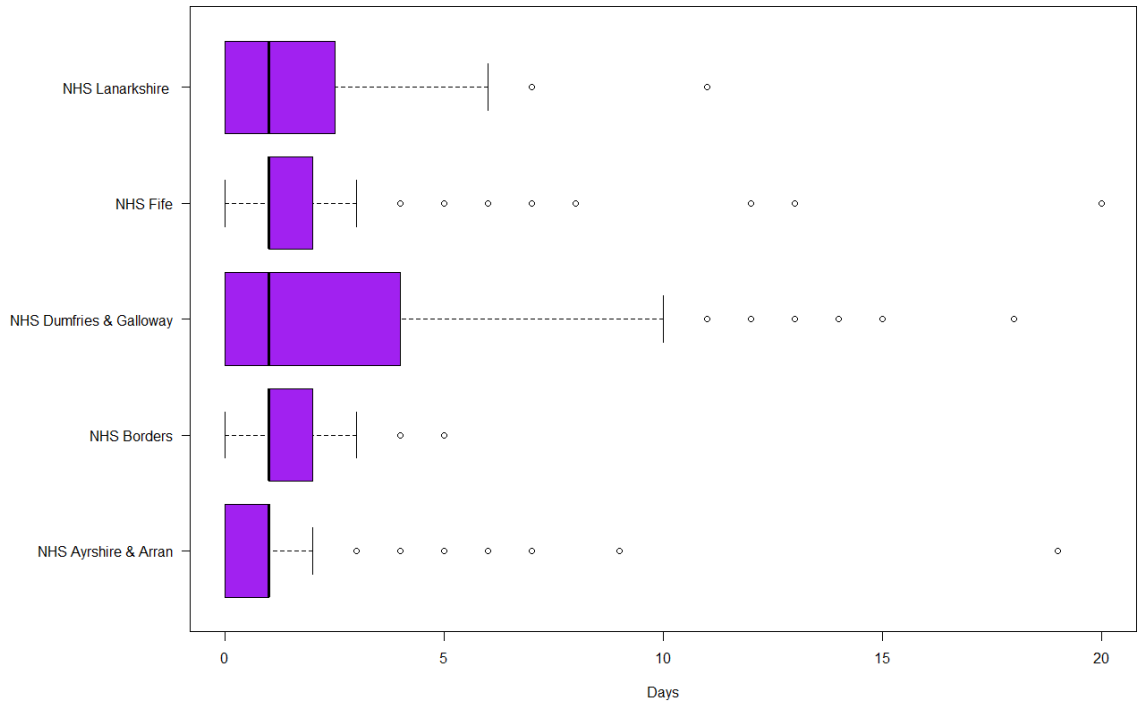

Figure 18: Time to vetting, by NHS Board

Pathway timings: time from referral to RCDS outcome

Figure 19 illustrates the variation of waiting times to RCDS outcome. RCDS outcome is recorded as being at the point where the patient is informed of diagnostic test results, having been reviewed by MDT, if necessary.

The overall mean time to outcome (across all boards) is 16.3 days (median 14 days, IQR 10-21 days). NHS D&G, which is an in-person clinic with hot reporting, generally has the shortest waiting times to outcome, with a mean of 10.7 days (median 10 days, IQR 6-13 days).

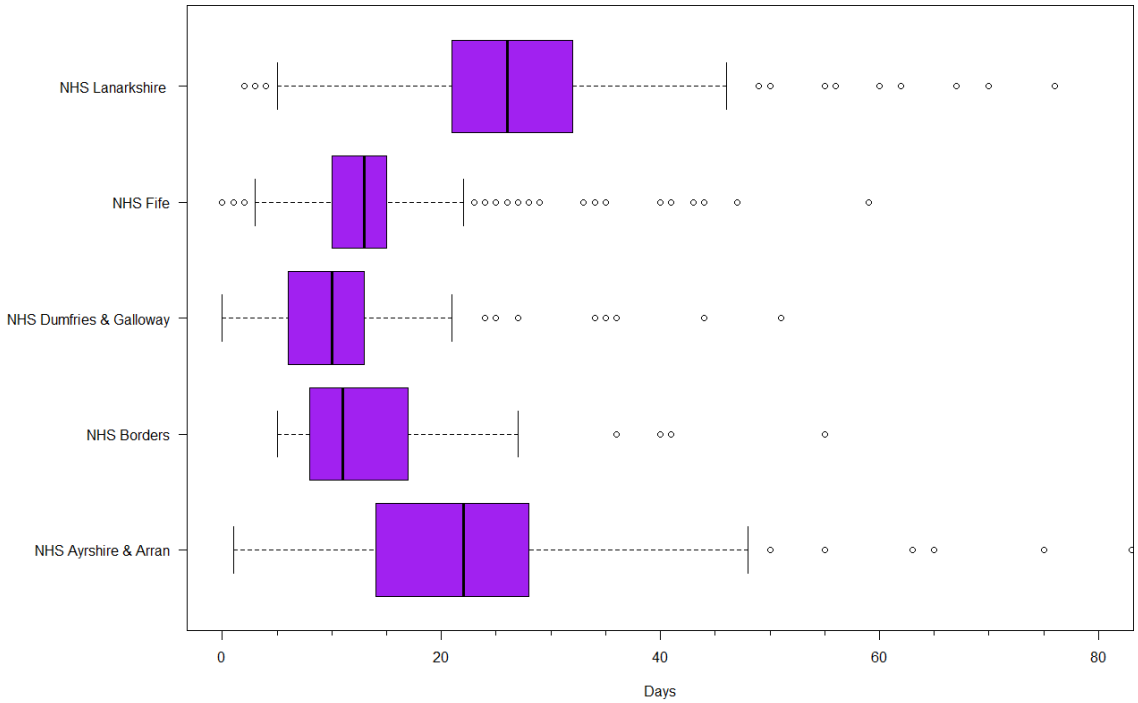

Figure 19: Time from referral to RCDS Outcome

Pathway timings: time from RCDS outcome to start of cancer treatment

The overall median time to cancer treatment from referral (not illustrated) is 62 days (IQR 42.5-102).

Health economic evaluation against general surgery pathways

As RCDS continues to expand across Scotland, and current RCDS Boards look to ensure financial sustainability, a health economic evaluation was conducted to aid decision making.

Both NHS Dumfries & Galloway and NHS Fife's RCDS pathways were compared to their pre-existing general surgery pathways. In both cases RCDS was found to be cost effective using a willingness to pay threshold of £20k.

At NHS Dumfries & Galloway, the mean cost difference per patient between RCDS and its comparator was £359, however the mean time to outcome was simulated to be ~67.3 days quicker. Taking account of the assumed phycological quality-of-life benefits associated with the earlier diagnosis, this resulted in a mean ICER of ~£19k.

At NHS Fife, the mean cost difference per patient between RCDS and its comparator was £135, with a mean time to outcome difference of ~75 days. This resulted in a mean ICER of ~£5.5k.

Overall, these findings are in line with the main conclusion of the study by Sewell et al. (2020) on the cost effectiveness of the pilot Rapid Diagnosis Centre (RDC) in Swansea Bay University Health Board (SBUHB) in Wales. For example, the Mean Cost per RCDS patient in the base case analysis for NHS Fife is £640, with a mean time to outcome of 13.6 days (see Appendix 2). This can be compared to the Mean Cost per RDC patient for the case of 2.78 patients per clinic (excluding patients who required further investigations) in SBUHB of £1068, with a mean time to diagnosis of 5.9 days (see Sewell et al., 2020, Table 1, page e189).

Since the ICER for NHS D&G was close to what may be considered the lower willingness to pay threshold of £20k, some additional scenarios were explored to see how cost effectiveness changed for different numbers of referrals per week, and by increasing the clinic capacity from 3 to 4. The results of these can be found in Appendix 1.

Additional scenarios were also run for NHS Fife, some to increase the number of referrals per week to infer the optimal number in terms of cost-effectiveness. This suggested that RCDS at NHS Fife could run with a mean of 22 patients per week whilst remaining within the 21-day target, with an overall ICER for comparison of only £183. An additional scenario was also conducted to reflect recent changes at NHS Fife which has resulted with RCDS resources being shared with other cancer pathways to give reduced resource (and hence cost) to the RCDS pathway. The result of this scenario can be found in Appendix 2.

A point worth noting for all three early adopter RCDS pathways is the significant proportion of patients that are referred to RCDS without having the initial suite of tests done by their GP (15%-74%). This can cause delay, particularly at NHS D&G where patients are not vetted until these are completed, and thus affect cost effectiveness.

RCDS and the GP Direct Access pathway

Factors influencing choice of RCDS over direct access to CT include GPs having a high suspicion of cancer and positive perceptions of specialist MDT input via RCDS. Conversely, factors influencing choice of GP Direct Access include GP maintaining ownership of the patient.
There appears to be a role for both GP Direct Access and RCDS in primary care, however there should be more definition and differentiation between the two to optimise the use of both pathways.

Where there is direct access to CT scanning, GPs must decide which option to choose, and there are guidelines for when direct access should be used (Scottish Clinical Imaging Network, 2015). There are several reasons why a GP would choose to send their patients to the RCDS, many of which provide reassurance to both GPs and patients:

- There is a perception that patients can be seen by radiology in a timelier manner.
- Patients receive a thorough examination and review by a specialist MDT.
- The amount of time a patient waits for a diagnosis can be reduced.
- Diagnoses that might otherwise be missed can be picked up.
- Appropriate onward referrals can be made within secondary care.

On the other hand, reasons why GPs would refer using the Direct Access route include:

- A wish to maintain greater ownership of their patient's treatment.
- For their frailer patients: *'I would probably be more likely to use a CT chest abdo pelvis...to then have a more realistic conversation with the patient about whether they want anything escalated, how suitable they would be for treatment'* (Prof 4).

A few primary care professionals who had access to both pathways saw a role for both GP Direct Access and RCDS routes and it appeared that the RCDS was the preferred route for '*when I really think the patients' got cancer' (Prof 13).* However, they did acknowledge that '*there's a lot of overlap with*

them' (Prof 4). Another professional highlighted that their team is *'…a bit confused as to which one to use and when'* (Prof 12) suggesting that more definition and differentiation between the pathways would be helpful to optimise the referral process.

RCDS and the GP Direct Access pathway modelling data

The NHS A&A GP Direct Access pathway was modelled on 2022 data. This data was chosen as it is taken at a time when RCDS and the GP Direct Access pathway ran in parallel to each other, meaning that any effects of one on the other in terms of cancer incidence and radiology demands are in effect. It was found to have a higher cancer incidence rate than RCDS at NHS A&A (~11.3% Vs ~5.9%). The frequency that patients arrive for the GP Direct Access pathway was slightly lower than that of RCDS. This equates to ~5.6 patients per week on direct access compared to ~6.9 on RCDS. Cancer types found on the GP Direct Access pathway were found to be similar to those found on RCDS, with lung and HPB being the two most common on both.

While it is likely that an economic comparison of the NHS A&A RCDS pathway to a general surgery pathway would have shown a similar result as that of the other two early adopter NHS Boards, a direct comparison of costs and timings with a GP Direct Access pathway is currently problematic. Any comparison of RCDS with a pathway in which the organisation and management of the diagnostic work-up falls on the GP rather than a wider team of specialist RCDS staff, would have to rely on several key assumptions that need to be underpinned by further in-depth research. First, the frequency of any tests (including CT scans) requested for patients may, or may not, be similar between the pathways: a possible assumption is that GPs may request more CT scans than RCDS teams. Second, the quality of diagnostic decision making may, or may not, differ significantly between the pathways: a possible assumption is that, in the absence of a specialist RCDS team, a GP Direct Access pathway may lead to unwarranted delays for some hard-to-diagnose patients. A solution that is both clinically effective and cost effective could involve running RCDS pathways and GP Direct Access pathways side-by-side (in addition to the site-specific pathways) provided that primary care physicians are guided to make referral choices that are optimal for each pathway.

Conclusion: Future of the RCDS model in Scotland

RCDS optimal components

Our detailed evaluations of the RCDS's show that the following pathway interventions appear to be working well in the current model. These should be reflected in any future model for patients with non-specific symptoms suspicious of cancer:

1. **Vetting and triage of referrals by the RCDS team, from primary care or otherwise, to the respective RCDS pathways.** All referrals to RCDS are made electronically. Each of the RCDS teams has developed and communicated a clear set of referral criteria (including the need for pre-referral blood and other tests and based on agreed and common RCDS principles) for the use of GPs and other healthcare professionals. Protocol-based vetting and triage occur in a timely manner, leading to clinically appropriate decisions regarding the next steps in the patient's care journey.
2. **Personalised and single point of contact provided for each patient by a designated RCDS team member.** Each of the RCDS teams includes a team member with a 'navigator' role – that is, a team member (who may, or may not, be formally called a patient navigator) who maintains a personal level of contact with each RCDS patient and guides them through the care journey. This includes coordinating (in-person or virtual) appointments and giving information about each part of the diagnostic pathway. The precise nature and timing of the contacts is adapted to each patient's individual needs (e.g., whether the patient has ready access to technology, or are currently in employment, etc.). Interviews and surveys show that this feature is highly valued by RCDS patients.
3. **Coordinated testing, including close liaison with the Radiology department.** For the speed and clinical performance of the RCDS pathways, it is vital that CT and other scans and tests are performed and reported in a timely manner. Each of the RCDS teams has made suitable arrangements with their local radiology department for fast and reliable access to diagnostic testing and reporting.
4. **Diagnostic decision making by the RCDS team/MDT.** Each of the RCDS teams has implemented an effective procedure for diagnostic decision making. This procedure includes an MDT meeting, which generally includes at least one lead clinician and the core RCDS team. Decisions about diagnosis and onward referral are made and communicated to the referring primary care physician and relevant secondary care departments, as well as to patients, in a clinically appropriate and timely manner.
5. **Appropriate onward referrals by the RCDS team for patients with an initial diagnosis or suspicion of cancer to a specialist cancer pathway.** Each of the RCDS teams has systems in place to ensure efficient tracking and running of the pathway up to and beyond the MDT meeting. Patients with obvious signs of cancer are likely to be immediately referred to the appropriate specialist pathway. The MDT meeting is particularly valuable for patients who may require further investigations before referral. To streamline referrals of cancer patients, RCDS teams generally cultivate formal and informal contacts with specialist pathways.

Possible further developments to the RCDS model

In our evaluations, we found a couple of points where the RCDS model could be further developed.

The first point concerns referral choices by primary care physicians to the RCDS pathway. There may be a degree of variation in referral choices by GPs, depending on the options currently available to them. This is particularly evident in circumstances where, in addition to site-specific pathways and the new RCDS pathway for patients with vague and complex symptoms, GPs have the option of using a Direct Access to imaging pathway. All referring primary care physicians should take note of the Scottish Referral Guidelines (SRGs) for suspected cancer, in addition to the specific referral criteria for their local RCDS pathway. However, individual GPs may differ in their precise interpretation of these criteria and guidelines. To further strengthen the RCDS model, primary care decision support tools could be used to help healthcare professionals recognise potential signs and symptoms of cancer.

The second point concerns the diagnosis and, where possible, effective treatment of non-cancer patients along and beyond the RCDS pathway. Around 90% of the RCDS patients do not have cancer. The latter are more or less equally divided between patients who have an initial non-cancer diagnosis and those for whom no clear diagnosis could be made. RCDS teams can refer patients diagnosed with specific non-cancer conditions to appropriate specialist services. For patients with no clear diagnosis, the RCDS teams generally strive, where possible, to give further advice to patients and their primary care referrers about their condition. As a possible development to the RCDS model, there could be longer-term follow-up of the latter patients to better understand how their health and care needs can be resolved.

Limitations

Two notable limitations should be noted. Firstly, no patients who had received a cancer diagnosis were interviewed as part of this evaluation. This may be in part due to the relatively small numbers of patients who were diagnosed with cancer. However, it was hoped that some interviews could be conducted with this patient group. However, it is quite likely that those patients were more focused on the next steps of their cancer diagnosis, and the opportunity to express their views of the RCDS pathway might not be high in their list of priorities. Secondly, one of the Health Boards had a larger proportion of patients taking part in interviews compared to the other Health Boards. This was true both in absolute numbers and when considering the relative sizes of each Health Board. This may be due to the higher number of patients that have been through the RCDS at that Health Board compared to the other Health Boards. Therefore, that Health Board had a bigger pool of patients who could be invited to take part in an interview.

Acknowledgements

The evaluation team would like to express their sincere thanks to all the patients and professionals who gave up their valuable time to take part in this evaluation.

REFERENCES

Dolly SO, Jones G, Allchorne P, Wheeler D, Ali S, Mukadam Y, Zheng S, Rahman L, Sindhar J, Moss CL, Harari D, Van Hemelrijck M, Cunliffe A, De Michele LV. The effectiveness of the Guy's Rapid Diagnostic Clinic (RDC) in detecting cancer and serious conditions in vague symptom patients. Br J Cancer. 2021 Mar;124(6):1079-1087. doi: 10.1038/s41416-020-01207-7. Epub 2021 Jan 5. PMID: 33402736; PMCID: PMC7783491.

Maguire R, Van der Meer, Egan K, Nixon I, Thompson N, Connaghan J, Innes R. 2022. Interim Report of the Evaluation of Rapid Cancer Diagnostic Services accessed on 27 Nov 2023) https://www.nhscfsd.co.uk/media/qbbbt02s/rapid-cancer-diagnostic-service-interim-report.pdf

Næser E, Fredberg U, Møller H, Vedsted P. Clinical characteristics and risk of serious disease in patients referred to a diagnostic centre: A cohort study. Cancer Epidemiol. 2017 Oct;50(Pt A):158-165. doi: 10.1016/j.canep.2017.07.014. Epub 2017 Aug 7. PMID: 28781173

Scottish Government. National Cancer Plan (2020-2023) – Recovery & Redesign: An Action Plan for Cancer Services 2020 (accessed on 27 Nov 2023) https://www.gov.scot/publications/recovery-redesign-action-plan-cancer-services/

Scottish Government. *A Fairer, Greener Scotland: Programme for Government 2021-22. 2021 (accessed 27 Nov 2023) https://www.gov.scot/publications/fairer-greener-scotland-programme-government-2021-22/*

Scottish Clinical Imaging Network. Guidance on Access Direct Access to CT for Primary Care Clinicians. 2015 (accessed 27 Nov 2023) https://www.scin.scot.nhs.uk/wp-content/uploads/2023/04/Guidance-on-Direct-Access-to-CT-for-Primary-Care-Clinicians.pdf

Sewell B, Jones M, Gray H, Wilkes H, Lloyd-Bennett C, Beddow K, Bevan M, Fitzsimmons D. Rapid cancer diagnosis for patients with vague symptoms: a cost-effectiveness study. British Journal of General Practice 2020; 70 (692): e186-e192. DOI: 10.3399/bjgp20X708077

Appendices

Appendix 1

NHS Dumfries & Galloway, further health economic evaluation scenarios

The NHS D&G RCDS pathway was modelled on an observed mean rate of ~3.34 referrals per week and a clinic capacity of 3 patients (referred to as 'the base case' hereafter). For the additional scenarios, mean arrival rates of 3 and 4 patient referrals per week were considered, using the same variability as observed in the base case, also with a clinic capacity of 3. Also explored were scenarios which considered an increased clinic capacity of 4 patients per week. These scenarios considered a mean of 4 and 5 patient referrals per week, also with the same variability as observed in the base case. These scenarios are summarised in Table 4, together with the mean ICERs.

For each of the scenarios, the same pathway acceptance rates and outcome diagnosis incidence rates were assumed as the base case. The scenario with 3 referrals per week gave a slightly inferior ICER to the base case, though still below the willingness to pay threshold of £20k. The scenario assuming 4 referrals per week, but with a capacity of 3, has an inferior ICER compared to the base case. This suggests that the current mean referral rate (~3.34) is more optimal than either of those, considering the acceptance rate.

Table 4: Additional scenarios for NHS D&G

Scenario	Mean Patient referrals (per-week)	Clinic Capacity	ICER (£)
Base case	~3.33	3	£19,044
3 referrals per week	3	3	£19,872
4 referrals per week	4	3	£22,031
Observed referrals. Increased capacity	~3.33	4	£16,851
4 referrals per week, increased capacity	4	4	£14,103
5 referrals per week, increased capacity	5	4	£15,153
6 referrals per week, increased capacity	6	4	£46,161

If the capacity of the clinic could be increased to 4, the pathway could potentially become more cost effective. Even with the current observed referral rate, the ICER was found to reduce significantly to £16,851, likely by ensuring patients are less likely to have to wait until a later clinic during periods of increased referrals due to natural variability. A mean of 4 referrals per week is shown to be more cost effective than both the observed rate and a mean of 5 referrals per week. The results show that while it is important to have close to capacity for optimal cost effectiveness, it appears preferable for the mean clinic attendance to run a little below capacity, such that patient delays are avoided (i.e., a mean of 4 referrals per week would equate to a mean clinic attendance of less than 4, given the pathway acceptance rate).

Appendix 2

NHS Fife, further health economic evaluation scenarios

In order to understand optimal referrals, according to the cost-effectiveness modelling assumptions, at NHS Fife, some additional simulations were run assuming the same staffing arrangement and RCDS pathway acceptance rate. This found that the pathway could run with 22 referrals per week (as opposed to the mean of between 13 and 14 that is currently expected) with the mean time to outcome increased, though remaining just within the 21 days target. This was shown to increase the overall cost effectiveness of the model – see Table 5. A greater number of average weekly referrals than this would not be expected to be met with current staffing arrangements according to the simulation.

Table 5: Additional scenarios for NHS Fife

Scenario	Simulated time to Outcome (days)	Mean Cost per patient (£)	ICER (£)
Base case	13.6	£640	£5,554
Reduced Resource	13.6	£589	£3,713