Scientific Knowledge Group

*Research Article*

**Journal of Clinical & Surgical Sciences**

# Role of FIT Test in Diagnosis of Colorectal Cancer in Patient Presenting with Bleeding Per Rectum

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**Received:** July 28, 2025;
**Accepted:** August 02, 2025;
**Published:** August 09, 2025

**Abstract**

**Background:** Colorectal cancer is a prevalent and deadly disease globally, ranking as the second leading cause of cancer-related deaths in the UK. Approximately 5% of the UK population is at risk of developing colorectal carcinoma during their lifetime. A notable number of patients are referred to two-week colorectal clinics to exclude the possibility of colorectal cancer, primarily when experiencing rectal bleeding alongside other lower gastrointestinal symptoms.

**Aim:** This study aims to evaluate the diagnostic accuracy of the faecal immunochemical test (FIT) in diagnosing colorectal cancer in patients presenting with rectal bleeding.

**Methods:** Patients referred from primary care with suspected colorectal cancer under the two-week wait pathway at Dr. Gray's Hospital in Elgin (NHS Grampian), Scotland, were retrospectively identified from the referral database spanning May 2022 to September 2023. Data were collected through a comprehensive review of hospital case notes, utilizing the computer database (Track Care) for investigations, correspondence, endoscopy, radiographic imaging, multidisciplinary team (MDT) discussions, operative courses, and cancer follow-up.

**Results:** During the study period, 253 patients were referred from primary care with suspected colorectal cancer on an urgent two-week wait pathway. Among them, 56.15% (114) were female and 43.84% (89) were male. The mean age of participants was 65 years, with a range of 25 to 90 years. A total of 50 patients (19.76%) were excluded from the study, resulting in a final cohort of 203 patients. Within this group, 76 patients (37.43%) presented with rectal bleeding, comprised of 63.15% females (48) and 36.84% males (28), yielding a ratio of 1:1.71. The incidence of colorectal cancer among patients presenting with rectal bleeding was 2.95%, with a positive FIT rate of 2.46% and a negative FIT rate of 0.49%.

**Conclusion:** The quantitative FIT demonstrates a high negative predictive value and sensitivity for colorectal cancer, suggesting its potential utility as a filter-out test for this condition in patients presenting with rectal bleeding. Raising awareness of the symptoms and signs associated with colorectal cancer could be advantageous and beneficial in early detection.

**Keywords:** Faecal Immunochemical Test (FIT), Colorectal Cancer (CRC), Rectal Bleeding, Diagnostic Accuracy, qFIT Sensitivity.

## Background

Colorectal cancer represents a significant global health challenge, with marked variation in incidence and mortality rates across different regions. A considerable number of patients are referred to two-week wait colorectal clinics, primarily to exclude colorectal cancer when present-

**Citation:** Mehak Chandio, Muhammed Bilal, Alpa Vadher Zainab Shaikh, Aijaz Memon, and Ashfaq Chandio (2025) Role of FIT Test in Diagnosis of Colorectal Cancer in Patient with Bleeding Per Rectum. J Clin & Sur Sci 1: 1-8.

ing with per rectal bleeding (PRB) and other lower gastrointestinal (LGI) symptoms. Rectal bleeding, regardless of its duration in individuals over 50 years old, or any occurrence of bleeding accompanied by changes in bowel habits in those over 40, qualifies for a two-week wait (2WW) referral for suspected colorectal cancer (CRC) [1]. Delays in diagnosis can lead to poorer outcomes for patients with cancer. Early detection through bowel screening is essential, yet studies indicate that the incidence of colorectal cancer is rising in populations not currently targeted by screening programs, particularly among adolescents and young adults.

In the UK, the National Institute for Health and Care Excellence (NICE) guidelines stipulate specific symptom criteria for urgent referrals under the 2WW pathway, including changes in bowel habits, abdominal pain, iron deficiency anaemia, and rectal bleeding. However, over 95% of patients referred through this pathway do not have colorectal cancer, as individual symptoms are often nonspecific and exhibit low positive predictive value for accurate diagnosis. Despite the increasing use of the 2WW referral pathway, many unnecessary investigations, which could be avoided, are requested. These investigations carry associated risks; for instance, the pooled rates of colonoscopy-related bleeding and perforation are reported at 1.64 per 1,000 and 0.85 per 1,000, respectively [2].

The Faecal Immunochemical Test (FIT) is designed to detect potential signs of bowel disease by identifying minute amounts of non-visible blood in stool samples through antibodies specific to human haemoglobin [3]. Various bowel pathologies that could evolve into cancer are more prone to bleeding compared to normal tissue, making blood in stool samples a potential indicator of underlying abnormalities. FIT has been developed as a more specific alternative to guaiac-based faecal occult blood tests (FOBT), which enhances accuracy in detecting human haemoglobin [4]. Unlike guaiac-based tests, which may inadvertently indicate upper gastrointestinal bleeding, FIT targets the globin component of haemoglobin that degrades during its passage through the gastrointestinal tract.

Numerous studies have explored the necessity of gastroscopy following a positive guaiac-based test paired with a negative colonoscopy; results have been mixed but suggest that some advanced gastric lesions can be identified through positive tests [5-9]. Patients who receive a positive FIT result are subsequently referred for further investigation via colonoscopy. The prognosis for colorectal cancer has significantly improved due to advancements in diagnosis, surgical referrals, and the expansion of systemic therapies and ablative techniques [10]. Early detection of cancer allows for more effective treatment options. Further research is necessary to enhance the timeliness of diagnostic follow-up and to identify effective strategies for reducing waiting times for diagnostic testing, especially in underserved or low-resource settings [5].

## Aim

The objective of this study is to establish the relevance of the quantitative Faecal Immunochemical Test (q FIT) as a first-line investigation for filtering out colorectal cancer in patients referred with rectal bleeding.

## Methods

This retrospective study identified all patients referred from primary care with suspected colorectal cancer under the two-week wait pathway at Dr. Gray's Hospital in Elgin (NHS Grampian), Scotland, UK, from May 2022 to September 2023. Data were extracted from the referral database associated with clinic appointments managed by a single colorectal consultant. A comprehensive review of hospital case notes was conducted, utilizing the computer database (Track Care) for investigations, correspondence, endoscopy reports, radiographic imaging, multidisciplinary team (MDT) discussions, operative courses, and cancer follow-up information.

Out of the 253 patients referred, 203 were included in the study after excluding 50 patients based on established exclusion criteria. Consequently, the final sample size consisted of 203 patients. (Table 1) The following parameters were systematically recorded: age, gender, source of referral, clinical presentation, investigations conducted, disease stage, details of MDT discussions, interventions, and patient outcomes.

During the study period, patients were categorized into four distinct groups for analysis:

- Group 1: Patients with rectal bleeding and a positive qFIT result
- Group 2: Patients with rectal bleeding and a negative qFIT result
- Group 3: Patients without rectal bleeding but with a positive qFIT result
- Group 4: Patients without rectal bleeding and with a negative qFIT result

**Table 1**

| |
|---|
| **Cohort 253**<br>Excluded 50<br>Included in study 203 |
| **Bleeding per rectum 76**<br>FIT + ve 53 cancer diagnosed in 5 and significant bowel pathology 32<br>FIT -ve 23 cancer diagnosed in 0 and significant bowel pathology 13 |
| **Other Bowel Symptoms 127**<br>FIT +ve 88 cancer diagnosed in 13 and significant bowel pathology 51<br>FIT -ve 39 cancer diagnosed in 1 and significant bowel pathology 17 |

**Groups/Pathology**

**Table 2:**

| Groups | No of cases | Pathology | |
|---|---|---|---|
| | | Cancer | SBP |
| | | | |
| Group 1 PRB with +ve FIT | 53 | 5 | 32 |
| | | | |
| Group 2 PRB with -ve FIT | 23 | 0 | 13 |
| | | | |

| | | | |
|---|---|---|---|
| Group 3 NPRB with +ve FIT | 88 | 13 | 51 |
| | | | |
| Group 4 NPRB with -ve FIT | 39 | 1 | 17 |
| | | | |
| | 203 | 19 | 113 |

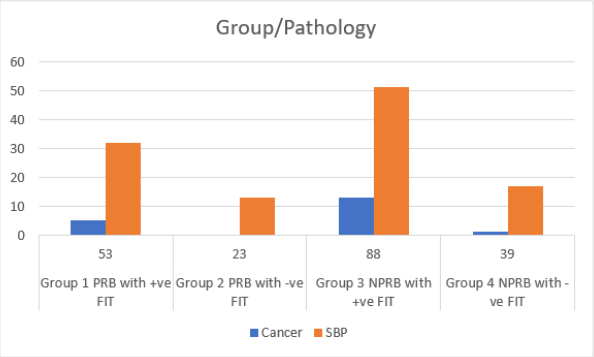


**Figure: 1**

**Inclusion Criteria:** All patients referred to the Colorectal Consultants clinic with suspected colorectal cancer who had completed their qFIT tests were included in this study.

**Exclusion Criteria**: Patients who either did not complete their qFIT test or refused follow-up after the initial consultation at the Colorectal Clinic were excluded. Additionally, those unable to tolerate any proposed investigations, such as endoscopy or CT colonography, were also not included.

## Data Collection

Patient records were meticulously searched through their physical notes, and the Trak Care software was utilized to confirm qFIT values, investigations conducted, and patient outcomes. A data sheet was created using Microsoft Excel to facilitate the calculation of relevant figures.

The primary outcome measure was to compare the sensitivity of the qFIT test for colorectal cancer in patients presenting with rectal bleeding (RB) versus those with non-rectal bleeding (NRB) symptoms. The secondary outcome measure aimed to determine the diagnostic yield of the qFIT across various ranges for colorectal cancer and other serious bowel diseases in patients with PR bleeding compared to those with NRB symptoms. (Table 3)

**Table 3**

| | Total (n) | Cancer | | | | | Significant Bowel Pathology (SBP) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (n) | NPV (%) | PPV (%) | Sen | Spe (%) | n | NPV (%) | PPV (%) | Sen | Spe (%) |
| **(Group 1)** PRB and q FIT +ve | 53 | 5 | 100 | 9.5 | 100 | 32.4 | 32 | 43.5 | 60.4 | 71.1 | 32.3 |
| **(Group 2)** PRB and q FIT -ve | 23 | 0 | | | | | 13 | | | | |
| **(Group 3)** NPRB and q FIT +ve | 88 | 13 | 97.4 | 14.7 | 92.9 | 33.6 | 51 | 56.5 | 57.9 | 75 | 37.3 |
| **(Group 4)** NPRB and q FIT - ve | 39 | 1 | | | | | 17 | | | | |

## Data Analysis

Patients were categorized into two main groups for analysis:

1. **Rectal Bleeding Group:** Patients referred with rectal bleeding either alone or in conjunction with other bowel symptoms.
2. **Non-Rectal Bleeding Group:** This group included patients presenting with any other eligible 2 week wait symptoms, such as iron deficiency anaemia, abdominal pain, weight loss, changes in bowel habits, and abdominal or rectal mass.

Colonoscopy outcomes were prioritized hierarchically; patients diagnosed with serious bowel diseases (SBD), including colorectal cancer (CRC) or inflammatory bowel disease (IBD), were ranked above those with other diagnoses.

## Statistical Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS, version 26). Mean values were compared using the student t-test. Non-parametric data were reported as median (interquartile range, IQR). Categorical data comparisons were performed using the chi-squared test. An odds ratio (OR) with a corresponding 95% confidence interval (CI) greater than 1 indicated a positive association, while an OR with a 95% CI less than 1 indicated a negative association. Two-sided p-values of less than 0.05 were considered statistically significant. The results were primarily illustrated through descriptive statistics (Table 4 - 8).

## Statistics

**Table 4: Means**

| Report | | | | | |
|---|---|---|---|---|---|
| | Age | Bleeding | No Bleed | Female | Male |
| Mean | 65 | 12.6667 | 21.1667 | 19 | 14.8333 |
| N | 6 | 6 | 6 | 6 | 6 |
| Std. Deviation | 18.70829 | 5.20256 | 12.937 | 10.89954 | 5.77639 |

**Table 5**

| One-Sample Test | | | | | | |
|---|---|---|---|---|---|---|
| | Test Value = 0 | | | | | |
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Age | 8.51 | 5 | 0 | 65 | 45.3669 | 84.6331 |
| Bleeding | 5.964 | 5 | 0.002 | 12.66667 | 7.2069 | 18.1264 |
| No Bleed | 4.008 | 5 | 0.01 | 21.16667 | 7.5901 | 34.7432 |
| Female | 4.27 | 5 | 0.008 | 19 | 7.5616 | 30.4384 |

**Table 6: t-Test: Two-Sample Assuming Equal Variances**

| | Rectal bleed | No rectal bleed |
|---|---|---|
| Mean | 12.66666667 | 21.16666667 |
| Variance | 27.06666667 | 167.3666667 |
| Observations | 6 | 6 |
| Pooled Variance | 97.21666667 | |
| Hypothesized Mean Difference | 0 | |
| df | 10 | |
| t Stat | -1.493169774 | |
| P(T<=t) one-tail | 0.083128153 | |
| t Critical one-tail | 1.812461123 | |
| P(T<=t) two-tail | 0.166256305 | |
| t Critical two-tail | 2.228138852 | |

**Table 7: t-Test: Two-Sample Assuming Unequal Variances**

| | Rectal bleed | No rectal bleed |
|---|---|---|
| Mean | 12.66666667 | 21.16666667 |
| Variance | 27.06666667 | 167.3666667 |
| Observations | 6 | 6 |
| Hypothesized Mean Difference | 0 | |
| df | 7 | |
| t Stat | -1.493169774 | |
| P(T<=t) one-tail | 0.089515478 | |
| t Critical one-tail | 1.894578605 | |
| P(T<=t) two-tail | 0.179030956 | |
| t Critical two-tail | 2.364624252 | |

**Table 8: Chi -Square**

| Test Statistics | | | |
|---|---|---|---|
| | Age | bleed | No bleed |
| Chi-Square | .000a | .667b | .000a |
| df | 5 | 4 | 5 |
| Asymp. Sig. | 1 | 0.955 | 1 |

a) 6 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.

b) 5 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.2.

## Results

During the study period, 253 patients were evaluated, of which 203 were included in the analysis, resulting in a sample size of 203 after excluding 50 patients based on the established exclusion criteria. The gender distribution comprised 114 females and 89 males, yielding a ratio of 1:1.28 (Fig. 2). The mean age of participants was 65 years, with ages ranging from 24 to 90 years (Table 9). Among the patients, 76 (37.4%) were referred due to rectal bleeding. Of these, 53 (69.7%) had positive quantitative faecal immunochemical test (qFIT) results, while 23 (30.3%) had negative qFIT results despite the presence of rectal bleeding. Additionally, 127 (62.6%) patients were referred for other significant bowel symptoms without rectal bleeding, including 88 (43.3%) with a positive qFIT and no rectal bleeding, and 39 (19.2%) with significant bowel symptoms alongside a negative qFIT Fig: 3. In the cohort with rectal bleeding and positive qFIT results, 76 patients were included, with 5 diagnosed with colorectal cancer. Conversely, the group without bleeding comprised 127 patients, of whom 14 were diagnosed with colorectal cancer. Overall, colorectal cancer was identified in 19 (9.35%) of the 203 patients. The incidence of colorectal cancer was notably higher among patients with a positive FIT test (6.4%) who presented significant bowel symptoms without rectal bleeding, followed by those with rectal bleeding and positive FIT test results (2.46%). No cases of colorectal cancer were found in patients with rectal bleeding and negative FIT results. The highest incidence of significant bowel pathology (25.1%) was observed in patients with a positive qFIT and other bowel symptoms, absent rectal bleeding, followed by those presenting with rectal bleeding and positive FIT results. The incidence of cancer for patients with rectal bleeding in the qFIT ranges of 10-150 and over 400 was similar, at 1.5% and 1.0%, respectively. Patients with rectal bleeding and a qFIT score between 10 and 150 exhibited the highest incidence of significant bowel pathology at 8.4%, compared to 5.9% in those with scores over 400, and 3.0% in those with medium qFIT scores of 150-400 (Table 10). Overall, the detection rates of colorectal cancer were highest in Group 3, which comprised patients with positive FIT results and significant bowel symptoms, at 13 (6.40%) (n=13/88). In contrast, the lowest detection rate was found in Group 4, where a negative FIT test and significant bowel symptoms were present, with only one patient (n=1/39) diagnosed with colorectal cancer. The majority of colorectal cancer cases were right-sided. Patients in Group 3 exhibited the highest incidence 11 (5.41 %), followed by Group 1 (0.98%), and Group 4 (0.49 %). Notably, Group 1 had the highest incidence of left-sided colorectal cancer (1.47 %), followed by Group 3 (0.98 %). Table 11 figure 4 A total of 76 patients (37.43%) referred under the urgent two-week wait

(2WW) pathway presented with rectal bleeding. Among these, 19 patients (9.35%) had normal findings on colonoscopy. The most frequently identified pathology across the entire cohort was diverticular disease, observed in 56 patients (27.58%). Of these, 16 patients (7.88%) were in the rectal bleeding group, while 40 patients (19.70%) had no rectal bleeding. Haemorrhoids were notably more common among patients presenting with rectal bleeding, identified in 14 patients (6.89%) compared to 4.92% in those without rectal bleeding. Although rectal bleeding is commonly regarded as an alarm symptom for colorectal cancer (CRC), not all patients with rectal bleeding and a positive quantitative faecal immunochemical test (qFIT) were diagnosed with malignancy. The incidence of colorectal cancer among patients with rectal bleeding varied by qFIT score: qFIT 10–150 ng/mL: 1.47%, qFIT >400 ng/mL: 0.98%

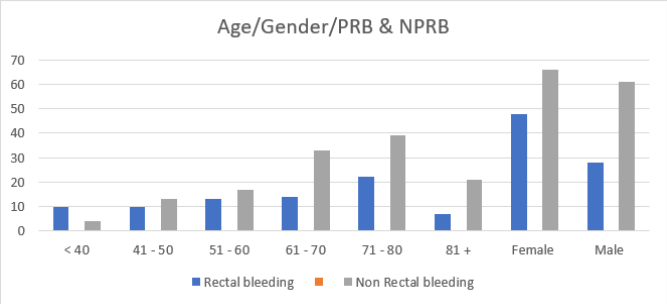


**Figure: 2**

**Table 9:**

| Age | Rectal bleeding | Non rectal bleeding |
|---|---|---|
| < 40 | 10 | 4 |
| 41 - 50 | 10 | 13 |
| 51 - 60 | 13 | 17 |
| 61 - 70 | 14 | 33 |
| 71 - 80 | 22 | 39 |
| 81 + | 7 | 21 |
| **Female** | **48** | **66** |
| **Male** | **28** | **61** |
| **Total** | **76** | **127** |

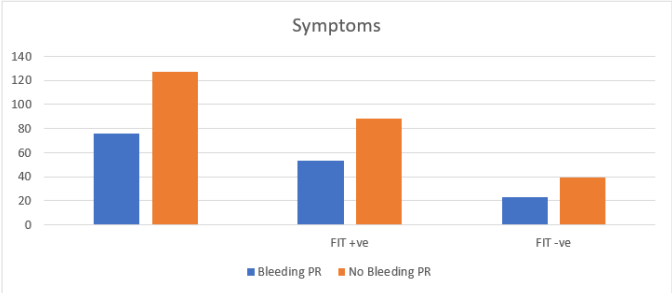


**Figure: 3**

**Table 10: FIT Test**

| | Bleeding per rectum | | | | No bleeding per rectum | | | |
|---|---|---|---|---|---|---|---|---|
| | Group 1 | | | Group 2 | Group 3 | | | Group 4 |
| q FIT ranges | **10-150** | **150-400** | **>400** | **<10** | 10-150 | 150-400 | >400 | <10 |
| Normal | 5 | - | 6 | 8 | 12 | 1 | 1 | 20 |
| Colorectal cancer | 3 | - | 2 | - | 5 | 3 | 6 | 0 |
| Inflammatory bowel disease | 2 | 1 | 5 | - | 3 | - | - | 2 |
| Low risk adenoma | 3 | 4 | 2 | 3 | 8 | - | - | 4 |
| Diverticular disease | 5 | 2 | 3 | 6 | 23 | 7 | 1 | 9 |
| Haemorrhoids | 4 | 3 | 2 | 5 | 6 | 2 | 1 | 1 |
| Angiodysplasia/ microscopic colitis | 1 | - | - | 1 | 1 | - | - | - |
| Benign polyps | - | - | - | - | 7 | - | 1 | 3 |
| | **23** | **10** | **20** | **23** | **65** | **13** | **10** | **39** |

**Table 11: Cancer in relation to site**

| | Right colon | Left + Rectum |
|---|---|---|
| **Group 1** PRB with +ve FIT | 2 | 3 |
| **Group 2** PRB with -ve FIT | 0 | 0 |
| **Group 3** NPRB with +ve FIT | 11 | 2 |
| **Group 4** NPRB with -ve FIT | 1 | 0 |
| **Total** | **14** | **5** |

The incidence of significant bowel pathology in the rectal bleeding group was also stratified by qFIT score: qFIT 10–150 ng/mL: 8.4%, qFIT >400 ng/mL: 5.9%, qFIT 150–400 ng/mL: 3.0%

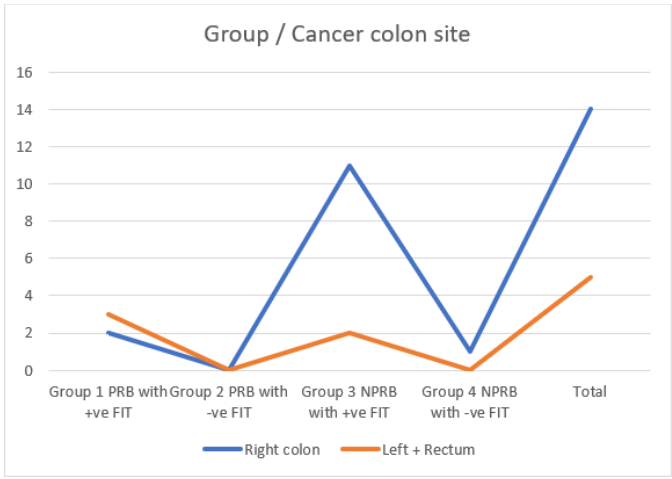


**Figure: 4**

These findings indicate that a considerable proportion (37.43%) of patients referred urgently with rectal bleeding were ultimately found to have benign conditions, most commonly diverticular disease and haemorrhoids. Cancer detection rates were low across all qFIT strata in this group. Interestingly, patients with moderately elevated qFIT scores (10–150 ng/mL) demonstrated a higher incidence of significant bowel pathology than those with markedly elevated scores, suggesting that the interpretation of qFIT in the context of rectal bleeding may be more nuanced than currently appreciated.

## Discussion

This study assesses the diagnostic accuracy of the quantitative faecal immunochemical test (qFIT) in detecting colorectal cancer (CRC) among patients presenting with rectal bleeding who were referred via the two-week wait (2WW) pathway. Rectal bleeding is a common but non-specific symptom, which often leads to referrals despite being caused by benign pathology in the majority of cases. Nonetheless, CRC risk increases in patients over 50 years or when rectal bleeding is accompanied by altered bowel habits, prompting a low threshold for referral [5]. The commonest causes of rectal bleeding alone are benign, nevertheless, most patients being referred are investigated with a colonoscopy even if haemorrhoids are present on examination and the patient has had longstanding symptoms [11]. This 'red flag' is, in part, a marker of General Practitioner suspicion [12]. The growth and accessibility of the local service, together with the South West pilot of 'low risk not no risk', saw an increase of patients with minor colorectal symptoms but primary care concern [13]. Our findings show a CRC detection rate of 9.35% in this cohort—comparable to the 6–11% detection rates reported in UK rapid investigation clinics. However, such clinics identify only about one-third of all CRC cases [14]. National data indicate that 55% of CRC diagnoses originate from GP referrals, with emergency presentations and screening contributing 20% and 9%, respectively [15, 16]. Notably, survival is highest among patients diagnosed through screening (up to 90%) or GP referrals (around 70%) compared to emergency presentations (52%). Curative intent in colorectal cancer was possible more often in patients diagnosed through screening (90%) or (70%) following GP referral and (52%) who presented with emergency admission [17, 18]. Bowel cancer screening reduces risk of dying from bowel cancer by at least 25%, survival rates are greatly improved if an individual is diagnosed early [19]. FIT has been widely accepted as a successor to the guaiac-based FOBT, offering a non-invasive and sensitive triage tool. Its high negative predictive value (NPV) allows it to act as an effective rule-out test for CRC. In our study, qFIT demonstrated 100% sensitivity and NPV at a 10 µg/g threshold in patients with rectal bleeding, and 97.4% sensitivity in those with other bowel symptoms—highlighting its strong potential to reduce unnecessary colonoscopies [20, 21]. Interestingly, only 26.1% of patients with rectal bleeding in our cohort had detectable faecal haemoglobin (f-Hb >10 µg/g), suggesting that many such cases may not require urgent investigation if benign causes are evident on examination. Conversely, CRC was rarely the underlying cause of rectal bleeding—only 6.5% in this study—which aligns with findings from other UK and European studies. FIT can used as a tool of triage toward or away from luminal investigation but not as a barrier to urgent cancer referral [22, 23]. The doctrines of the FIT test for human haemoglobin (Hb) were portrayed by Suovaniemi, who studied an antibody specific to human globin, the protein component of Hb [24]. We demonstrate that q FIT has a high negative predictive value and sensitivity for colorectal cancer and could therefore be used as a FILTER-OUT test in this group of the Patients. This is similar to other published studies data published in recent years had shown that FIT negative patients had a low risk of luminal cancer [25, 26]. International estimates based on recent randomized cohort suggest that stool-based screening is associated with a 15- 33% reduction in Colorectal cancer mortality rates [27-30]. In our study q FIT sensitivity and negative predictive value for colorectal cancer was 100 % at a cut- off of 10 µg/g for the patients referred with rectal bleeding and 97.4% for the patients presented with other bowel symptoms. The high NPV 100% at the same cut- offs, suggests that the chance of colorectal cancer with a 'negative' FIT (10 µg/g) is very low. This is similar to study in Israel [31]. Although, bleeding per rectum is considered a 'red flag' symptom for colorectal cancer prompting urgent investigations, in fact it is caused by an underlying colorectal cancer in less than 6.5% of patients referred for colonoscopy. In a Scottish study, with a threshold of 80µg Hb/g of stool, the percentage of interval CRC was 51% [32]. In an Italian study, with a threshold of 20µg Hb/g of stool the percentage of interval CRC was 31% [33]. Ultimately, Buron et al. have also shown that the probability of testing positive in consecutive screens and being diagnosed with advanced neoplasia rose with increasing values of negative FIT, which contradicts with our results [34]. The highest rate of significant bowel pathology (SBP) occurred in patients with qFIT scores between 10–150 µg/g, reinforcing the importance of nuanced interpretation of intermediate FIT values. This finding is comparable with the study of Farrugia et al. [35]. Notably, patients with PR bleeding and high qFIT scores (>400 µg/g) did not always have CRC, challenging assumptions made in prior studies such as that by Hicks et al. who demonstrated high sensitivity of FIT for detecting CRC in patients presenting with rectal bleeding, however, in our study this could be due to the small number of patients with rectal bleeding and moderate (150 – 400) q FIT score in a particular subgroup [36]. Incidence for cancer in our study in patients with bleeding per rectum in the q FIT range (10-150) and (>400) was almost similar with the percentage at 1.47% and 0.98% respectively. Flexible sigmoidoscopy may suffice as an initial investigation for many patients, particularly when rectal bleeding is not accompanied by anaemia or a palpable mass. Our data support this view, showing most CRCs in PR bleeding cases were distal to the splenic flexure. Yet, flexible sigmoidoscopy alone would have missed 10.53% of CRCs in our cohort, indicating a need for case-by-case risk assessment. this is similar to the study of Cross et al. [37]. We believe in the absence of anaemia or an abdominal mass an argument may be made for investigation with flexible sigmoidoscopy alone. Flexible sigmoidoscopy is a wonderful means of detecting distal advanced neoplasia In the UK and the Prostate, Lung, Colorectal and Ovarian (PLCO) cancer screening trial in the USA, flexible sigmoidoscopy reduced colorectal cancer incidence in the distal colon by a stunning 50% compared with the control group [38, 39]. The threshold for referral to colonoscopy does influence the detection rate of advanced proximal neoplasia. Unfortunately, FIT is not terribly effective at detecting advanced neoplasia. Routine flexible sigmoidoscopy to manage patients with 'negative' FIT results would further reduce the

probability of undetected Colorectal cancer and significant bowel pathology and will diagnose the benign causes of rectal bleeding. Despite its strengths, FIT has limitations. It cannot localize pathology, and its effectiveness at detecting proximal advanced neoplasia is limited. Studies from Japan and the NORCAPP trial suggest that combining FIT with sigmoidoscopy does not significantly improve detection of proximal lesions [40, 41]. Despite innovation, there are still no strong recommendations on the best diagnostic approach for FIT positive patients with isolated rectal bleeding and no other worrying features [42]. This study benefits from a robust design: a wide demographic representation, symptom and sample assessment in primary care, blinded analysis, and consistent secondary care evaluation by a single colorectal surgeon. However, limitations include potential selection bias, variability in colonoscopy access, and underreporting of haemorrhoids or other benign pathology on imaging. Additionally, not all patients underwent colonoscopy—the gold standard diagnostic tool—with some receiving CT colonography due to fitness concerns. Diagnosis of haemorrhoids may be underestimated if the endoscopist did not code for the pathology in the presence of other significant pathology present on the Endoscopy software or if it missed altogether in CT Colonoscopy. Patients may also have had some shrinkage of haemorrhoids during the waiting time for referral. Both would affect whether f-Hb is detected on qFIT and at what concentration. This could explain why some patients with Rectal Bleeding and detectable f- Hb were reported to have a 'normal' colonoscopy. Our Colonoscopy waiting time in NHS Grampian is not strictly 2 weeks for all the patients, this could change the results and impact on the patient's outcome. The results of our study suggest that using the q FIT in patients with Rectal Bleeding would help primary care physicians decide whether to refer a patient for further diagnostic investigation or not. Patients with a detectable f- Hb >10 (26.10% of patients with RB in this study) should be referred on a 2WW urgent pathway for colonoscopy. Those with undetectable f- Hb could be managed symptomatically in primary care or referred to dedicated benign colorectal clinics, especially if bleeding is associated with perianal or benign causes– for example haemorrhoids or an anal fissure were clinically evident on examination. This study showed that f- Hb is not always detected in patients with Rectal Bleeding. Detectable f-Hb (f- Hb >10 µg/g) was present in only 26.10% of patients with Rectal Bleeding, compared with 73.90% of no rectal bleed (NRB) patients. The faecal immunochemical test can rule out colorectal cancer (CRC) in majority of the patients referred with rectal bleeding. Contrary to the common misconception, faecal haemoglobin is undetectable in a (11.33% in our study) of patients presenting with rectal bleeding. In patients with rectal bleeding and undetectable f- Hb (q Fit < 10), the use of flexible sigmoidoscopy would reduce the probability of undetected CRC and will identify most benign pathologies

## Conclusion

In conclusion, qFIT shows high sensitivity and NPV in patients with rectal bleeding and can support risk stratification and referral decisions in primary care. A qFIT result >10 µg/g warrants urgent referral via the 2WW pathway, while those with undetectable f-Hb and evidence of benign pathology may be managed conservatively or referred to benign colorectal clinics. Flexible sigmoidoscopy offers a valuable diagnostic approach for patients with rectal bleeding and negative FIT, further reducing the likelihood of missed pathology.

## Disclosure

No financial support received and no conflict of interest to declare.

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