

MIPS Peer-Reviewed Journal Article Requirement Template

Section 101(c)(1) of the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) requires submission of new measures for publication in applicable specialty-appropriate, peer-reviewed journals prior to implementing in the Merit-based Incentive Payment System (MIPS). Such measures will be submitted by the Centers for Medicare & Medicaid Services (CMS), to a journal(s), before including any new measure on the MIPS Quality Measures List. The measure submitter shall provide the required information for article submission under the MACRA per the MIPS Annual Call for Quality Measures submission process.

Interested parties submitting measures for consideration through the MIPS Annual Call for Quality Measures must complete the required information by the CMS Annual Call for Measures deadline (8 p.m. ET on May 1, 2025). Some of the information requested below may be listed in specific fields in the CMS Measures Under Consideration (MUC) Entry/Review Information Tool (MERIT); however, to ensure that CMS has all of the necessary information and avoid delays in the evaluation of your submission, please fully complete this form as an attached Word document. The information in MERIT must be consistent with the information below, including the following, but not limited to:

- **Measure Title:** Rate of Timely Follow-up on Positive Stool-based Tests for Colorectal Cancer Detection
- **Meaningful Measures 2.0 Framework Domain:** Closing Gaps of Care

Measure Steward: Brigham and Women's Hospital

Measure Developer: Brigham and Women's Hospital

Description: This electronic Clinical Quality Measure (eCQM) reports the percentage of patients aged 45 to 75 years with at least one positive stool-based colorectal cancer screening test (i.e., high-sensitivity guaiac fecal occult blood test, fecal immunochemical test, or Cologuard®) during the measurement period (i.e., calendar year) who completed a colonoscopy within 180 days after their index (i.e., first) positive stool-based test result date.

I. Statement

- Background (Why is this measure important?).

Colorectal cancer is the second leading cause of cancer mortality in the United States for men and women combined [1]. In 2024, around 152,810 patients were diagnosed with colorectal cancer and 53,010 were expected to die from it. Early detection and removal of colorectal polyps and early-stage cancers prevents disease progression and improves the odds of survival [2]. Noninvasive screening tests (e.g., stool-based tests) are available to detect markers of abnormal growths. However, delays in follow-up colonoscopy reduce the benefits of screening by leading to missed opportunities for timely intervention.

Multiple guidelines recommend using stool-based tests (i.e., high-sensitivity Guaiac FOBT, FIT, FIT-DNA) as noninvasive screening options, and colonoscopy as the gold standard for follow up in patients with a positive stool-based test result [3, 4, 5]. An American Gastroenterological Association (AGA) Clinical Practice Update recommended that at least 95% of patients receive a colonoscopy within 6 months of a positive noninvasive test result to complete the full screening process [6]. Existing literature supports this timeframe as patients who received their colonoscopies after the 6-month mark had a significantly higher risk of being diagnosed with more advanced stages of cancer [7].

Rates of timely follow-up in the U.S. are far below the benchmark recommended by the AGA. A 2023 study examining 39 U.S. health care organizations reported follow-up colonoscopy rates around 50% within 180 days of a positive stool-based test [8]. A follow-up study in 2024 reported rates of around 56.1% within the same timeframe [9].

Existing endorsed clinical quality measures report on the percentage of patients who received initial screening for colorectal cancer [10, 11]. This eCQM can be used to measure rates of timely completion of the full screening process after positive non-invasive colorectal cancer screening stool-based test results to help improve health care delivery and quality in medical facilities and health systems across the U.S.

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- Environmental scan (Are there existing measures in this area?).

There is currently one endorsed quality measure related to colorectal cancer screening:

1. **Colorectal Cancer Screening** (Higher rate = better): “Percentage of patients aged 45-75 years who had appropriate screening for colorectal cancer” (NQF #0034, Quality ID #113)

This clinical quality measure quantifies the percentage of screen-eligible patients that initiated the colorectal cancer screening process. The novel eCQM submitted for consideration complements the endorsed measure described above by reporting the percentage of patients that completed the multi-step colorectal cancer screening process after an initial positive stool-based test result.

II. Gap Analysis

- Provide evidence for the measure (What are the gaps and opportunities to improve care?).
- Expected outcome (patient care/patient health improvements, cost savings).
- Recommendation for the measure (Is it based on a study, consensus opinion, USPSTF recommendation etc.?).

Colorectal cancer is the second most expensive cancer to treat after breast cancer, costing about \$24.3 billion for both medical services and prescription drugs combined [1]. Colorectal cancer is easier to treat when caught

in its earlier stages [2]. Around 89% of patients with early-stage colorectal cancer live for five years or more compared to only 16% with later-stage cancer [2]. The United States Preventive Services Task Force (USPSTF) guidelines recommend universal colorectal cancer screening in patients aged 45-49 years (Grade B recommendation) and 50-75 years (Grade A recommendation) [3]. Increasing screening rates to 80% can reduce colorectal cancer mortality by 33% by 2030 [3]. Increasing rates to 70% for adults aged 50-64 can reduce Medicare spending by over \$10 billion by 2050 [4]. Therefore, screening via inexpensive noninvasive stool tests, like the high-sensitivity gFOBT, FIT, and FIT-DNA, is more cost-effective and cost-saving compared to no screening [5]. Screening strategies that use a combination of stool-based testing and follow-up colonoscopy lead to greater reductions in costs and gains in quality-adjusted life years than single test strategies [5, 6, 7].

Patients with a positive stool test who do not receive follow-up colonoscopy within 180 days are at a significantly increased risk of being diagnosed with later-stage cancer [9]. A systematic review and meta-analysis by Mutneja et al. (2021) reported that “the odds of detecting any colorectal cancer (odds ratio [OR] 1.58, 95% confidence interval [CI] 1.23–2.03, $P < 0.001$), advanced-stage colorectal cancer (OR 2.16, 95% CI 1.47–3.16, $P < 0.001$), or advanced adenomas (OR 1.17, 95% CI 1.06–1.28, $P = 0.001$) are significantly higher if the colonoscopies are performed after 6 months from a positive fecal test, compared with within 6 months. There was no significant difference in the detection rates based on a 1-month, a 2-month, or a 3-month cut-off” [9]. In a 2017 study, facilities had follow-up rates as low as 28% within 365 days [10]. A 2023 retrospective analysis showed follow-up rates of 56% within a year of a positive stool-based test across 39 health care organizations [11]. Timely follow-up within 180 days was 51%, highlighting an urgent need for implementing interventions to reach the American Gastroenterological Association (AGA) recommended 95% benchmark [11, 12].

Rates of timely follow-up were lower among historically disadvantaged and medically underserved communities, further emphasizing the necessity of tailored interventions to increase colonoscopy uptake for all patient populations. Black, Asian, and Hispanic/Latino patients, older individuals, non-English speakers, Medicare and Medicaid beneficiaries, those with no recent history of stool-based test use, and patients with one or more comorbidities were more likely to have a delayed follow-up [10, 11, 13, 14, 15, 16, 17].

Medical facilities and health systems face common challenges in increasing their rates of timely follow-up colonoscopy [10, 13, 14, 15, 16, 18, 19]. A 2022 study observed that site-level factors had a greater impact on follow-up colonoscopy rates than patient demographic factors [16]. Patients who did not have a referral for colonoscopy were more likely to miss opportunities for screening completion [10, 13, 14, 18]. Failure to provide adequate bowel preparation instructions to patients may further delay colonoscopy completion in patients with suboptimal bowel preparation [16, 20, 21]. Although some safety-net systems shared an electronic health record, inadequate documentation of patient data prevented tracking of follow-up [10, 18, 19]. Additionally, a lack of standard protocols for appropriate clinical workflows to coordinate care from the positive stool-based test to the colonoscopy have contributed to loss of follow-up [10, 13, 14, 15, 19].

Interventions for improving rates of timely colonoscopy uptake after positive stool-based tests have been outlined in the literature. These include timely transmission of referrals to GI specialists, patient navigation and case management, patient education on colorectal cancer screening and adequate bowel preparation, active patient outreach by the care coordination team, and electronic health record (EHR) reminders [19, 21, 22, 23, 24, 25]. EHR-based trigger algorithms have also been shown to be effective in reducing time to follow-up for colorectal cancer detection [18, 26]. These evidence-based approaches can be integrated into protocols to ensure the timeliness of care.

Timely follow-up rates were higher for patients with a positive FIT-DNA (i.e., multitarget stool DNA panel, Cologuard®) than for positive FITs, suggesting that the FIT-DNA may increase adherence to the completion of screening [11].

In 2023, the USPSTF issued a call to action to increase the rates of follow-up colonoscopy after positive stool-based screening tests, cautioning that considerable out-of-pocket costs for follow-up colonoscopies may reduce rates of screening completion [27, 28]. As of January 2023, commercial insurance and Medicare providers are federally obligated to cover the costs of follow-up colonoscopies to lower the impact of this financial disparity [17, 27, 28, 29].

Therefore, increases in the rates of timely follow-up colonoscopy will require the engagement of various stakeholders, including patients, health care providers, medical facilities, health systems, and regulatory bodies

to dictate policies that can help prevent delayed follow-up and improve colorectal cancer care outcomes for all patients. Furthermore, a 2023 study found that out of the clinicians representing over 30 health care sites in qualitative interviews, 100% were not aware of the low rates of follow-up colonoscopy within their organizations [11]. There are currently no standard tools and systems in place requiring medical facilities to track the rates of timely colonoscopy after a positive stool-based screening test.

This eCQM can be used to measure rates of timely follow-up colonoscopy within 180 days after positive stool-based testing for colorectal cancer detection. The development of this measure was based on current clinical practice guidelines for colorectal cancer screening, recent published literature, and existing endorsed quality measures. The results of this measure can help facilities identify areas of improvement that may be specific to their particular setting and the communities being served. Facilities, health systems, and other stakeholders may also use this measure to develop targeted interventions to increase colonoscopy uptake in populations with lower rates of timely follow-up.

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III. Reliability/Validity

- What testing has been performed at the level of implementation? (MIPS requires full measure testing at the individual clinician level (and may also need to be tested at the group level) for MIPS Clinical Quality Measures (CQMs) and Electronic Clinical Quality Measures (eCQMs)

collection types. Administrative claims measures tested at the group level require a reliability threshold to be implemented at the group level.)

Please provide testing results including the N value, Bonnie test case results, correlation coefficient and any other pertinent information or values to be considered.

Measure Specifications

Numerator: Patients in the denominator population who completed a colonoscopy within 180 days after their index (i.e., first) positive stool-based colorectal cancer screening test result date.

1. If documented, extract the first colonoscopy occurring within 180 days after the index positive stool test result date for each patient [value set: "Colonoscopy" OID 2.16.840.1.113883.3.464.1003.108.12.1020].
2. Patients that completed a colonoscopy within 180 days are included in the numerator population.

Denominator: Patients aged 45 to 75 years with at least one positive stool-based colorectal cancer screening test result date during the measurement period (i.e., calendar year). Only the first positive stool test result (i.e., index screening test) is included in the measure calculation.

1. Identify all stool-based colorectal cancer screening tests (i.e., high-sensitivity guaiac fecal occult blood test, fecal immunochemical test, or Cologuard®) with result dates in the measurement period (i.e., calendar year) [value set "Colorectal Screening" OID 2.16.840.1.113762.1.4.1206.57].
2. Retain stool tests with positive results.
3. Retain stool tests where patients were aged between 45 and 75 years on the positive stool test result date [value set "Birth Date" OID 2.16.840.1.113883.3.560.100.4].
4. Patients with at least one positive stool test result are included in the target population.

Denominator Exclusions: Exclude positive stool-based colorectal cancer screening tests that were not an index test or were conducted in the inpatient or emergency department setting. Exclude index positive stool tests from the denominator population where patients had a history of colorectal cancer or total colectomy, or recently received hospice or palliative care.

1. Identify the first positive stool-based colorectal cancer screening test result in the measurement period (i.e., calendar year) for each patient to define the index positive stool tests and index test result dates [value set "Colorectal Screening" OID 2.16.840.1.113762.1.4.1206.57].
2. Exclude index positive stool tests conducted in inpatient or emergency department settings [value sets: "Encounter Inpatient" OID 2.16.840.1.113883.3.666.5.307; "Emergency Department Evaluation and Management Visit" OID 2.16.840.1.113883.3.464.1003.101.12.1010].
3. Exclude index positive stool tests where the patient had a prior positive stool test result less than 1 year before the index positive stool test result date.
4. Exclude index positive stool tests where patients had a documented history of colorectal cancer before the index positive stool test result date [value set: "Malignant Neoplasm of Colon" OID 2.16.840.1.113883.3.464.1003.108.12.1001].
5. Exclude index positive stool tests where patients had a documented history of total colectomy before the index positive stool test result date [value set: "Total Colectomy" OID 2.16.840.1.113883.3.464.1003.198.12.1019].
6. Exclude index positive stool tests where patients received hospice or palliative care within 1 year before or within 180 days after the index positive stool test result date [value sets: "Hospice Care Ambulatory" OID 2.16.840.1.113883.3.526.3.1584; "Hospice Diagnosis" OID 2.16.840.1.113883.3.464.1003.1165; "Hospice Encounter" OID 2.16.840.1.113883.3.464.1003.1003; "Palliative Care Encounter" OID 2.16.840.1.113883.3.600.1.1575; "Palliative Care Diagnosis" OID 2.16.840.1.113883.3.464.1003.1167; "Palliative Care Intervention" OID 2.16.840.1.113883.3.464.1003.198.12.1135].

Denominator Exceptions: Exclude index positive stool tests from the denominator population only if the patients are not in the numerator population in cases where the patients completed a prior recent colonoscopy or died during the 180-day follow-up period.

1. Exclude index positive stool tests (only if patient not in the numerator population) where patients completed a colonoscopy within 3 years before the index positive stool test result date [value set: "Colonoscopy" OID 2.16.840.1.113883.3.464.1003.108.12.1020].
2. Exclude index positive stool tests (only if patient not in the numerator population) where patients were deceased within 180 days after the index positive stool test result date [value set "Expired" OID 2.16.840.1.113762.1.4.1047.438].

MADiE results: 52 test cases passed with 100% coverage.

Evidence of Performance Gap

Table 1 presents health system characteristics and overall eCQM rates, and **Table 2** shows the patient and test characteristics for the included samples by health system.

Table 1. Health System Characteristics and Overall eCQM Rates by Health System

Characteristics	Health System 1 (n = 4,812)	Health System 2 (n = 1,191)	Health System 3 (n = 838)
Stool tests completed for colorectal cancer screening — no.	95,809	Not reported	11,448
Positive stool tests — no.	5,700	Not reported	2,051
Positive index stool tests — no.	5,049	1,203	1,020
Positive index stool tests excluded from eCQM — no.	237	12	182
Positive index stool tests included in eCQM — no.	4,812	1,191	838
Number with timely colonoscopy (eCQM numerator) — no.	2,708	771	426
eCQM rate of timely colonoscopy — %	56.3%	64.7%	50.8%
Number of hospital-affiliated facility groups — no.	6	1	1
Number of measurement years — no. (range of years)	6 (2018-2023)	8 (2016-2023)	6 (2018-2023)

Table 2. Patient and Test Characteristics for Included Samples by Health System

Characteristics	Health System 1 (n = 4,812)	Health System 2 (n = 1,191)	Health System 3 (n = 838)
Age at index positive stool test			
Mean (SD) — yr	62.8 (8.5)	61.94 (8.1)	60.57
Distribution — no. (%)			
45 to 49 yr	395 (8.2)	73 (6.1)	79 (9.4)
50 to 64 yr	2,107 (43.8)	561 (47.1)	461 (55.0)
65 to 75 yr	2,310 (48.0)	557 (46.8)	298 (35.6)
Sex — no. (%)			
Female	2,817 (58.5)	677 (56.8)	462 (55.1)
Male	1,995 (41.5)	515 (43.2)	376 (44.9)
Race — no. (%)			
Asian	194 (4.0)	16 (1.3)	17 (2.0)
Black	259 (5.4)	60 (5.0)	79 (9.4)
White	3,929 (81.7)	1,029 (86.4)	721 (86.0)
Other*	13 (0.3)	76 (6.4)	14 (1.7)
Unknown	417 (8.7)	10 (0.8)	5 (0.60)
Ethnic group — no. (%)			
Hispanic	402 (8.4)	21 (1.8)	0 (0)
Non-Hispanic	4,051 (84.2)	1,130 (94.9)	798 (95.2)
Unknown	359 (7.5)	40 (3.4)	40 (4.8)

Primary insurance at index positive stool test — no. (%)			
Private	1,902 (39.5)	599 (50.3)	268 (32.0)
Medicare	991 (20.6)	526 (44.2)	238 (28.4)
Medicaid	367 (7.6)	60 (5.0)	82 (9.8)
Other	17 (0.4)	5 (0.4)	18 (2.1)
Unknown	1,535 (31.9)	1 (0.01)	232 (27.7)
Primary language — no. (%)			
English	4,340 (90.2)	1,162 (97.6)	818 (97.6)
Spanish	277 (5.8)	7 (0.59)	6 (0.7)
Other	152 (3.2)	17 (1.4)	14 (1.7)
Unknown	43 (0.9)	5 (0.42)	0 (0)
Type of index positive stool test — no. (%)			
Fecal Immunochemical Test (FIT)	1,607 (33.4)	242 (20.3)	15 (1.8)
FIT-DNA (i.e., Cologuard®)	3,120 (64.8)	948 (79.6)	799 (95.3)
Guaiac Fecal Occult Blood Test (gFOBT)	85 (1.8)	1 (0.01)	24 (2.9)

*Patients identified as American Indian, Alaska Native, or Native Hawaiian or Other Pacific Islander.

Table 3 presents the eCQM performance rates for Health System 1 at the integrated delivery system level by year.

Table 3. eCQM Rates by Year for the Integrated Delivery System for **Health System 1**

Measurement Year	eCQM Rate of Timely Colonoscopy (95% CI)
Overall	56.3 (54.9, 57.7)
2018	57.9 (52.4, 63.4)
2019	58.6 (54.3, 62.8)
2020	49.2 (44.4, 53.9)
2021	58.0 (54.7, 61.3)
2022	54.7 (51.8, 57.6)
2023	57.3 (54.9, 59.8)

Table 4 shows the eCQM rates at Health System 1 by facility group and by year. **Tables 5 and 6** present the eCQM performance rates for Health Systems 2 and 3 at the facility group level by year.

Table 4. eCQM Rates by Year for 6 Hospital-affiliated Facility Groups at **Health System 1**

Measurement Year	eCQM Rate of Timely Colonoscopy (95% CI)					
	Facility Group 1	Facility Group 2	Facility Group 3	Facility Group 4	Facility Group 5	Facility Group 6
Overall	37.9 (32.7, 43.2)	51.7 (46.9, 56.6)	56.7 (53.9, 59.5)	56.7 (54.0, 59.4)	60.3 (57.7, 62.9)	63.1 (55.9, 70.2)
2018	42.1 (19.3, 64.9)	61.9 (40.6, 83.2)	49.4 (38.3, 60.5)	56.9 (44.0, 69.8)	61.5 (52.3, 70.6)	82.6 (66.8, 98.4)
2019	71.4 (46.9, 96.0)	54.3 (39.8, 68.9)	63.7 (55.2, 72.2)	52.9 (45.0, 60.8)	61.1 (53.2, 68.9)	53.8 (34.3, 73.4)
2020	33.3 (16.2, 50.5)	41.2 (24.4, 58.0)	43.1 (34.5, 51.6)	57.7 (48.2, 67.2)	53.9 (44.8, 63.1)	56.3 (31.1, 81.4)
2021	38.9 (25.8, 52.0)	56.9 (45.4, 68.5)	57.9 (51.6, 64.1)	59.4 (52.4, 66.3)	61.3 (55.5, 67.2)	56.5 (35.8, 77.2)
2022	39.4 (29.4, 49.3)	57.5 (48.1, 67.0)	58.4 (52.9, 64.0)	51.0 (45.4, 56.6)	59.3 (53.6, 65.0)	51.4 (34.6, 68.2)
2023	32.8 (24.2, 41.3)	44.2 (35.6, 52.8)	58.6 (53.5, 63.6)	60.4 (56.0, 64.8)	61.6 (57.0, 66.1)	71.7 (59.5, 83.9)

Table 5. eCQM Rates by Year for 1 Hospital-affiliated Facility Group at **Health System 2**

Measurement Year	eCQM Rate of Timely Colonoscopy (95% CI)
Overall	64.7 (62.0, 67.5)
2016	70.0 (53.5, 83.4)
2017	78.7 (66.3, 88.1)
2018	82.6 (71.6, 90.7)
2019	73.9 (67.8, 79.3)
2020	62.0 (54.5, 69.2)
2021	66.3 (58.8, 73.2)
2022	58.8 (51.6, 65.7)
2023	50.9 (44.2, 57.6)

Table 6. eCQM Rates by Year for 1 Hospital-affiliated Facility Group at **Health System 3**

Measurement Year	eCQM Rate of Timely Colonoscopy (95% CI)
Overall	50.8 (47.4, 54.3)
2018	66.7 (2.1, 99.9)
2019	28.2 (17.5, 38.8)
2020	37.5 (27.2, 47.8)
2021	59.6 (49.5, 69.7)
2022	57.4 (47.4, 67.5)
2023	50.6 (40.6, 60.7)

The overall eCQM performance rates for the three healthcare systems were moderate at 56.3% (95% CI: 54.9, 57.7), 64.7% (95% CI: 62.0, 67.5), and 50.8% (95% CI: 47.4, 54.3). The eCQM facility group performance rates across all three health systems and years ranged from 28.2% (95% CI: 17.5, 38.8) to 82.6% (95% CI: 66.8, 98.4), demonstrating large significant differences across facility groups and years, as well as substantial opportunities for improvement across most facility groups. These differences persisted in 2023, which is most reflective of current performance, with eCQM performance rates ranging from 32.8% (95% CI: 24.2, 41.3) to 71.7% (95% CI: 59.5, 83.9).

Table 7 presents overall eCQM rates for individual clinicians at Health System 1, which ranged from 45.0% (95% CI: 23.2, 66.8) to 78.3% (95% CI: 61.4, 95.1). Rates were only reported for the 11 (of 1,126) individual clinicians included in the reliability analyses, which required a denominator of at least 20 index positive stool-based tests across all years (2018-2023). eCQM rates were not reported by year due to very low sample sizes; none of the individual clinicians had a denominator of at least 20 in a single year. Based on these data and stakeholder consultations, this eCQM is not recommended for use at the individual clinician level.

Table 7. eCQM Rates for 11 Individual Clinicians at **Health System 1**

Clinician	eCQM Rate of Timely Colonoscopy (95% CI)
Overall	60.9 (55.4, 66.5)
1	45.0 (23.2, 66.8)
2	47.8 (27.4, 68.2)
3	48.2 (29.3, 67.0)
4	48.3 (30.1, 66.5)
5	51.7 (33.5, 69.9)
6	56.5 (36.3, 76.8)
7	60.0 (38.5, 81.5)
8	69.7 (54.0, 85.4)
9	73.5 (58.7, 88.4)
10	77.8 (64.2, 91.4)
11	78.3 (61.4, 95.1)

A recent American Gastroenterological Association (AGA) Clinical Practice Update recommended a 95% benchmark for completion of colonoscopy within 180 days after a positive stool-based test [1]. This eCQM

provides an assessment of hospital-affiliated facility group capacity to complete timely diagnostic evaluation with colonoscopy. Literature estimates that 10-15% of colonoscopies are completed outside of the health system where the positive stool-based test was performed and resulted [2]. However, even compared with a lower benchmark of 80% accommodating for out-of-system follow-up, there remain substantial opportunities for improvement across facility groups.

References:

1. Burke CA, Lieberman D, Feuerstein JD. AGA Clinical Practice Update on Approach to the Use of Noninvasive Colorectal Cancer Screening Options: Commentary. Gastroenterology. 2022;162(3):952-956. doi:10.1053/j.gastro.2021.09.075. PMID: 35094786.
2. Mohl JT, Ciemins EL, Miller-Wilson LA, Gillen A, Luo R, Colangelo F. Rates of Follow-up Colonoscopy After a Positive Stool-Based Screening Test Result for Colorectal Cancer Among Health Care Organizations in the US, 2017-2020. JAMA Netw Open. 2023;6(1):e2251384. Published 2023 Jan 3. doi:10.1001/jamanetworkopen.2022.51384. PMID: 36652246.

The above benchmarks are provided to demonstrate a performance gap rather than recommend a formal benchmark for this eCQM.

The Technical Expert Panel (TEP) recommended the follow-up timeframe of 180 days based on evidence presented in the published literature that this is the shortest delay associated with significant impacts on patient health outcomes. The TEP and other stakeholders recommended shortening the timeframe in future iterations of the eCQM specifications as the timeliness of care improves. In response, the eCQM rates were also calculated for 60-day (Appendix 1) and 90-day (Appendix 2) follow-up timeframes.

- Reliability Testing Results at the accountable entity level

Signal-to-Noise Analyses

Signal-to-Noise Ratios (SNR) were calculated for the six hospital-affiliated facility groups and 11 individual clinicians (e.g., primary care providers) at Health System 1. The signal-to-noise analysis estimated the proportion of overall variability explained by the differences between measured entities. A minimum sample size of 20 patients was required for the signal-to-noise analysis. The results are reported overall and by year from 2018 to 2023 for the facility group level, since the measure is intended to be reported annually. Reliability could not be assessed by year at the individual clinician level due to very low sample sizes; none of the individual clinicians had a denominator of at least 20 in a single year.

The facility group SNRs are provided in **Table 8**. Overall, the median SNR was 0.715 (95% CI: 0.662, 0.763) for the six hospital-affiliated facility groups. The minimum SNR was 0.076 and the maximum SNR was 0.976. The SNRs increased over time from 2018 to 2023. The median SNR for 2023, which is most reflective of current performance, was 0.911 (95% CI: 0.860, 0.981) for the six hospital-affiliated facility groups. The minimum SNR was 0.859 and the maximum SNR was 0.971 in 2023.

The SNRs were more reliable for the years 2022 and 2023, which had substantially larger sample sizes accounting for 56% of the data used for the analysis. The median SNR of 0.911 (95% CI: 0.860, 0.981) in 2023 indicated that a high proportion of overall variability was explained by the differences between measured entities (i.e., hospital-affiliated facility groups) that year. The increased median SNR and narrower confidence intervals can be attributed to larger sample sizes and increased variability between hospital-affiliated facility groups in 2023.

Table 8. Signal-to-Noise Ratios (SNR), Overall and by Year from 2018 to 2023 for Six Facility Groups in Health System 1

Measurement Year	Median SNR (95% CI)	Minimum SNR	Maximum SNR
Overall	0.715 (0.662, 0.763)	0.076	0.976
2018	0.423 (0.316, 0.720)	0.375	0.749
2019	0.145 (0.039, 0.354)	0.076	0.340
2020	0.406 (0.272, 0.683)	0.301	0.666

2021	0.360 (0.192, 0.642)	0.223	0.642
2022	0.639 (0.495, 0.849)	0.485	0.822
2023	0.911 (0.860, 0.981)	0.859	0.971

At the individual clinician level, the overall median SNR was 0.451 (95% CI: 0.383, 0.519) for the 11 clinicians with a denominator of at least 20 index positive stool-based tests across all years (2018-2023). The minimum SNR was 0.363 and the maximum SNR was 0.576. SNRs could not be assessed by year due to very low sample sizes; none of the individual clinicians had a denominator of at least 20 positive tests in a single year. Based on these data and supported by stakeholder consultations, this eCQM is not recommended for use at the individual clinician level.

Random Split-Half Correlation Analyses

A random half split correlation was conducted at the hospital-affiliated facility group and individual clinician levels at Health System 1, with six facility groups and 11 individual clinicians included in the analyses. To perform a random half split correlation analysis, we required a minimum of 20 patients for each facility group per year or individual clinician (10 patients in each split sample). Patients were randomly split by facility group and year or individual clinician into a test sample or a validation sample, with ~50% of patients in each sample. The descriptive statistics and p-values for each group were calculated. Spearman's rank correlation coefficients and Interclass Correlation Coefficients (ICC) were calculated with 95% confidence intervals. The ICCs were calculated to describe how much variation in the facility group or clinician level scores was due to facility group or clinician level signal variation. The Spearman's rank correlation coefficients were calculated to compare the relative rankings of facility groups or individual clinicians in the test and validation samples. The Spearman's rank correlation coefficients and ICCs were reported overall and by year for the facility group level since the measure is intended to be reported annually. Reliability could not be assessed by year at the individual clinician level due to very low sample sizes; none of the individual clinicians had a denominator of at least 20 positive tests in a single year.

Spearman's Rank Correlation Coefficient

The overall facility group Spearman's rank correlation coefficient was 0.36 (95% CI: 0.04, 0.62) (**Table 9**). The correlations were very low in 2020-2021 and improved for 2022-2023. The Spearman's rank correlation coefficient for 2023, which is most reflective of current performance, was 0.83 (95% CI: -0.03, 0.98).

The Spearman's rank correlation coefficient of 0.83 (95% CI: -0.03, 0.98) indicated a strong positive correlation between the test and validation samples. The increased correlation can be attributed to increased variability between hospital-affiliated facility groups in 2023. However, the 95% CI is very wide given that only six facility groups were included in the analysis. Additional facility group data is required to generate narrower confidence intervals.

Table 9. Spearman's Rank-Order Correlation Coefficients, Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Test-Validation Correlation	95% CI
Overall	0.36	0.04, 0.62
2018	0.60	-0.46, 0.94
2019	0.60	-0.46, 0.94
2020	0.02	-0.80, 0.82
2021	-0.46	-0.92, 0.59
2022	0.54	-0.52, 0.93
2023	0.83	-0.03, 0.98

At the individual clinician level, the overall Spearman's rank correlation coefficient was 0.24 (95% CI: -0.43, 0.73) for the 11 clinicians with a denominator of at least 20 index positive stool-based tests across all years (2018-2023). Spearman's rank correlation coefficients could not be assessed by year due to very low sample sizes; none of the individual clinicians had a denominator of at least 20 in a single year. Based on these data and supported by stakeholder consultations, this eCQM is not recommended for use at the individual clinician level.

Interclass Correlation Coefficients (ICC)

The overall facility group ICC was 0.025 (95% CI: 0.008, 0.243) in the test sample and 0.037 (95% CI: 0.013, 0.302) in the validation sample (**Table 10**). There were no apparent trends over time. The overall ICCs were low, indicating that a low proportion of variation in the facility group level scores was due to facility group level signal variation. Notably, the 95% CIs were very wide given that only six facility groups were included in the analysis. Additional facility group data is required to generate narrower confidence intervals.

Table 10. Interclass Correlation Coefficients (ICC), Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Test Sample (95% CI)	Validation Sample (95% CI)
Overall	0.025 (0.008, 0.243)	0.037 (0.013, 0.302)
2018	0.054 (0.009, 0.999)	0.002 (0.001, 0.999)
2019	0.025 (0.002, 0.999)	0.021 (0.004, 0.914)
2020	0.006 (0.001, 0.999)	0.019 (0.003, 0.999)
2021	0.031 (0.004, 0.999)	0.052 (0.012, 0.910)
2022	0.018 (0.004, 0.905)	0.007 (0.001, 0.999)
2023	0.006 (0.001, 0.999)	0.019 (0.003, 0.999)

At the individual clinician level, the overall ICC was 0.070 (95% CI: 0.021, 0.703) in the test sample and 0.032 (95% CI: 0.005, 0.999) in the validation sample, indicating that a low proportion of variation in the clinician level scores was due to clinician level signal variation. ICCs could not be assessed by year due to very low sample sizes; none of the individual clinicians had a denominator of at least 20 positive tests in a single year. Based on these data and supported by stakeholder consultations, this eQCM is not recommended for use at the individual clinician level.

- Face Validity Testing Results, Clinician Sites

Technical Expert Panel (TEP) Face Validity Voting

The Technical Expert Panel (TEP) consisted of six members, representing the patient experience and expertise in medicine, measure development, quality and safety of care, cancer screening, health services research, and electronic health records (EHRs). During a July 2024 meeting, the TEP was presented with final measure specifications and revised rate calculations at the integrated health system level and the hospital (i.e., hospital-affiliated facility group level). The TEP also had an opportunity to discuss questions and provide feedback to the measure development team at this time. A formal face validity vote was conducted using the polling function in Zoom.

The TEP members were asked to agree (vote YES) or disagree (vote NO) on the following two statements:

1. The Timely Follow-up on Positive Stool-based Screening Tests for Colorectal Cancer Detection – eQCM, as specified at the integrated health system level, can be used to distinguish good from poor quality care.
2. The Timely Follow-up on Positive Stool-based Screening Tests for Colorectal Cancer Detection – eQCM, as specified at the hospital level, can be used to distinguish good from poor quality care.

The final vote for #1 was 6/6 members (100%) in agreement with the statement at the integrated health system level. The final vote for #2 was 5/6 members (83.3%) in agreement with the statement at the hospital level.

The majority of TEP members agreed that the measure can be used to distinguish good from poor quality care at the hospital (i.e., facility group) level.

- Empiric Validity Testing Results at the accountable entity level

Empiric validity testing was not conducted at the accountable-entity level.

- Data Element/Patient Encounter Level Testing

Patient-level Data Element Validity Percentage Agreement, Kappa, and Positive Predictive Value

Chart reviews on the final data extractions were conducted on a random sample of 100 patients at Health System 1 and 30 patients at Health System 2 to assess whether the eCQM appropriately allocated patients into the numerator, denominator only, or excluded to calculate the eCQM rates. Manual chart review was considered the criterion standard. Chart reviewers were blinded to the eCQM automated allocations and reviewed the full chart to assess whether each patient should be included in the numerator or denominator only, or excluded from the measure. Percentage agreement and Kappa were calculated between the criterion standard manual chart review allocations and the eCQM automated allocations. The Positive Predictive Value (PPV) of the denominator was also calculated to quantify the proportion of patients included in the denominator that required short-term follow-up with a colonoscopy. Health System 3 is in the process of conducting chart reviews.

Health System 1

From the random sample of 100 patients, 8 were excluded from the denominator, 36 were included in the denominator only, and 56 were included in the numerator.

Percentage agreement: 100%

Kappa: 1.0

PPV: 100%

Health System 2

From the random sample of 30 patients, 9 were included in the denominator only and 21 were included in the numerator.

Percentage agreement: 100%

Kappa: 1.0

PPV: 100%

All 12 patients excluded from the denominator by the eCQM were manually reviewed and confirmed to be correctly excluded.

The 100% agreements, Kappas of 1.0, and PPVs of 100% demonstrated strong validity of the eCQM automated allocations and ability to calculate accurate eCQM rates.

- Exclusion Frequency

The exclusion frequencies were very low at Health Systems 1 and 2 (**Table 11**). Health System 1 excluded 237 of 5,049 patients (4.7%), and Health System 2 excluded 12 of 1,203 patients (1%). Exclusions were higher at Health System 3, where 182 of 1,020 patients were excluded (17.8%). Most of the patients at Health System 3 were excluded because the stool-based tests were conducted in emergency department or hospital settings. **Table 11** shows the patient and test characteristics for the excluded samples by health system.

Table 11. Patient and Test Characteristics for Excluded Samples by Health System

Characteristics	Health System 1 (n = 237)	Health System 2 (n = 12)	Health System 3 (n = 182)
<i>Age at index positive stool test</i>			
Mean (SD) — yr	65.6 (7.3)	64.15 (7.5)	61.50 (NR)
Distribution — no. (%)			
45 to 49 yr	9 (3.6)	1 (8.3)	22 (12.1)
50 to 64 yr	86 (34.5)	3 (25.0)	83 (45.6)
65 to 75 yr	154 (61.8)	8 (66.7)	77 (42.3)
<i>Sex — no. (%)</i>			
Female	130 (54.9)	4 (33.3)	92 (50.5)
Male	107 (45.1)	8 (66.7)	90 (49.5)
<i>Race — no. (%)</i>			

Asian	5 (2.1)	0 (0)	2 (1.1)
Black	21 (8.9)	0 (0)	37 (20.3)
White	192 (81.0)	12 (100)	139 (76.4)
Other*	0 (0.0)	0 (0)	4 (2.2)
Unknown	19 (8.0)	0 (0)	0 (0.0)
Ethnic group — no. (%)			
Hispanic	21 (8.9)	0 (0)	0 (0.0)
Non-Hispanic	204 (86.1)	12 (100)	150 (82.4)
Unknown	12 (5.1)	0 (0)	32 (17.6)
Primary insurance at index positive stool test — no. (%)			
Private	93 (39.2)	3 (25.0)	22 (12.1)
Medicare	91 (38.4)	8 (66.7)	60 (33.0)
Medicaid	11 (4.6)	1 (8.3)	25 (13.7)
Other	0 (0.0)	0 (0)	13 (7.1)
Unknown	42 (17.7)	0 (0)	62 (34.1)
Primary language — no. (%)			
English	217 (91.6)	12 (100)	175 (96.2)
Spanish	15 (6.3)	0 (0)	4 (2.2)
Other	5 (2.1)	0 (0)	3 (1.6)
Unknown	0 (0.0)	0 (0)	0 (0.0)
Type of index positive stool test — no. (%)			
Fecal Immunochemical Test (FIT)	136 (57.4)	5 (41.7)	27 (14.8)
FIT-DNA (i.e., Cologuard)	56 (23.6)	7 (58.3)	55 (30.2)
Guaiaac Fecal Occult Blood Test (gFOBT)	45 (19.0)	0 (0)	100 (54.9)

*Patients identified as American Indian, Alaska Native, or Native Hawaiian or Other Pacific Islander.

- What were the minimum sample sizes used for reliability results?

A minimum of 20 patients for each facility group per year (10 patients in each split sample) were required for accountable-entity level reliability testing. A minimum of 20 patients for each clinician overall across all years (10 patients in each split sample) were required for clinician level testing; testing by year was not possible due to very low sample sizes per clinician.

- Other Information
 - Is it risk adjusted? If so, how?
The eCQM is not risk adjusted.
 - What benchmarking information is available?
A recent American Gastroenterological Association (AGA) Clinical Practice Update recommended a 95% benchmark for completion of colonoscopy within 180 days after a positive stool-based test [1]. This eCQM provides an assessment of hospital-affiliated facility group capacity to complete timely diagnostic evaluation with colonoscopy. Literature estimates that 10-15% of colonoscopies are completed outside of the health system where the positive stool-based test was performed and resulted [2]. Therefore, it may be more appropriate to apply a benchmark accommodating out-of-system follow-up, such as an 80% benchmark for in-system follow-up.

References:

1. Burke CA, Lieberman D, Feuerstein JD. AGA Clinical Practice Update on Approach to the Use of Noninvasive Colorectal Cancer Screening Options: Commentary. *Gastroenterology*. 2022;162(3):952-956. doi:10.1053/j.gastro.2021.09.075. PMID: 35094786.

2. Mohl JT, Ciemins EL, Miller-Wilson LA, Gillen A, Luo R, Colangelo F. Rates of Follow-up Colonoscopy After a Positive Stool-Based Screening Test Result for Colorectal Cancer Among Health Care Organizations in the US, 2017-2020. JAMA Netw Open. 2023;6(1):e2251384. Published 2023 Jan 3. doi:10.1001/jamanetworkopen.2022.51384. PMID: 36652246.

- Collection Type: Specify the data collection type.
This eCQM leverages electronic health record (EHR) data.
- Specify measure stage of development.
Completed stages of development: measure conceptualization, measure specification, and measure testing.
- For Patient Reported Outcome Performance Measures:
 - The survey or tool has been tested and doesn't require modifications based on results?
 - Patient/encounter level testing for each critical data element doesn't require changes to the tool base on the results?

This eCQM is not a Patient Reported Outcome Performance Measure.

IV. Endorsement

- Provide the Consensus-Based Entity (CBE) (i.e., Partnership for Quality Measures (PQM)) endorsement status (and CBE ID) and/or other endorsing body. If the measure is only endorsed for paper records, please note endorsement for only the data source being submitted.

This eCQM (CBE ID 4705e) was endorsed with conditions by the Partnership for Quality Measurement (PQM) in March 2025.

V. Summary

- Alignment with CMS Meaningful Measures Initiative or MACRA (if applicable).

This eCQM falls under the following Meaningful Measure 2.0 domains: Closing Gaps of Care; Safety; and Value, Affordability, and Efficiency.

- Relevance to MIPS or other CMS programs.

This eCQM is relevant to MIPS and other Quality Payment Programs where the goals of the programs are to improve the quality of healthcare (processes and patient outcomes) while also reducing the costs of care. This eCQM reports on timely follow-up colonoscopy after positive stool-based colorectal cancer screening tests, which can lead to prevention of colorectal cancer (through removal of precancerous polyps) or earlier detection if cancer is present, less invasive treatments, better patient outcomes, and higher quality of life in survivorship.

- Rationale: Use of measure for inclusion in program (specialty society, regional collaborative, other).

Colorectal cancer is the second leading cause of cancer mortality in the United States for men and women combined [1]. In 2024, around 152,810 patients were diagnosed with colorectal cancer and 53,010 were expected to die from it. Early detection and removal of colorectal polyps and early-stage cancers prevents disease progression and improves the odds of survival [2]. Noninvasive screening tests (e.g., stool-based tests) are available to detect markers of abnormal growths. However, delays in follow-up colonoscopy reduce the benefits of screening by leading to missed opportunities for timely intervention.

Multiple guidelines recommend using stool-based tests (i.e., high-sensitivity Guaiac FOBT, FIT, FIT-DNA) as noninvasive screening options, and colonoscopy as the gold standard for follow-up in patients with a positive stool-based test result [3, 4, 5]. An American Gastroenterological Association (AGA) Clinical Practice Update recommended that at least 95% of patients receive a colonoscopy within 6 months of a positive noninvasive test result to complete the full screening process [6]. Existing literature supports this timeframe as patients who received their colonoscopies after the 6-month mark had a significantly higher risk of being diagnosed with more advanced stages of cancer [7].

Rates of timely follow-up in the U.S. are far below the benchmark recommended by the AGA. A 2023 study examining 39 U.S. health care organizations reported follow-up colonoscopy rates around 50% within 180 days of a positive stool-based test [8]. A follow-up study in 2024 reported rates of around 56.1% within the same timeframe [9].

Existing endorsed clinical quality measures report on the percentage of patients who received initial screening for colorectal cancer [10, 11]. This eCQM can be used to measure rates of timely completion of the full screening process after positive non-invasive colorectal cancer screening stool-based test results to help improve health care delivery and quality in medical facilities and health systems across the U.S.

References:

1. Key Statistics for Colorectal Cancer. American Cancer Society. Accessed October 31, 2024. <https://www.cancer.org/cancer/types/colon-rectal-cancer/about/key-statistics.html>.
2. Corley DA, Jensen CD, Quinn VP, et al. Association Between Time to Colonoscopy After a Positive Fecal Test Result and Risk of Colorectal Cancer and Cancer Stage at Diagnosis. *JAMA*. 2017;317(16):1631-1641. doi:10.1001/jama.2017.3634. PMID: 28444278.
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- Public reporting (if applicable).

Not applicable, this is a novel eCQM.

- Preferable relevant peer-reviewed journal for publication.

Annals of Internal Medicine.

- Rationale as to how the measure correlates to existing cost measures and improvement activities, as applicable and feasible.

Not applicable.

APPENDIX 1: 60-day Follow-up Rates and Accountable-entity Level Reliability Testing

Health System 1 had an overall integrated delivery system 60-day follow-up colonoscopy rate of 30.6% (95% CI: 29.3, 31.9). Health System 2 had an overall 60-day follow-up colonoscopy rate of 28.4% (95% CI: 25.8, 31.0).

The facility group rates by year for Health System 1 are presented in **Table 12**.

Table 12. eCQM Rates by Year for Six Hospital-affiliated Facility Groups at **Health System 1**

Measurement Year	eCQM Rate of Timely Diagnostic Resolution (95% CI)					
	<i>Facility Group 1</i>	<i>Facility Group 2</i>	<i>Facility Group 3</i>	<i>Facility Group 4</i>	<i>Facility Group 5</i>	<i>Facility Group 6</i>
Overall	18.4 (14.2, 22.6)	30.2 (25.8, 34.7)	29.6 (27.1, 32.1)	30.8 (28.3, 33.3)	34.0 (31.5, 36.5)	33.5 (26.6, 40.5)
2018	31.6 (10.7, 52.5)	33.3 (13.2, 53.5)	27.9 (18.0, 37.7)	39.7 (27.1, 52.2)	38.5 (29.4, 47.7)	21.7 (4.9, 38.6)
2019	57.1 (31.2, 83.1)	32.6 (19.1, 46.2)	40.3 (31.7, 49.0)	36.8 (29.2, 44.4)	38.3 (30.5, 46.1)	34.6 (16.3, 52.9)
2020	30.0 (13.6, 46.4)	20.0 (6.8, 33.3)	18.5 (11.8, 25.1)	29.8 (21.0, 38.6)	34.2 (25.5, 42.9)	25.0 (3.8, 26.2)
2021	13.2 (4.1, 22.3)	27.8 (17.4, 38.1)	29.8 (24.0, 35.5)	27.6 (21.3, 33.9)	35.3 (29.6, 41.0)	34.8 (15.3, 54.3)
2022	18.1 (10.3, 25.9)	35.5 (26.5, 44.6)	30.7 (25.5, 35.9)	24.7 (19.9, 29.5)	29.1 (23.9, 34.4)	40.0 (23.8, 56.2)
2023	11.2 (5.5, 17.0)	28.7 (20.9, 36.5)	29.3 (24.6, 34.0)	33.1 (28.9, 37.3)	33.6 (29.2, 38.1)	35.9 (22.9, 48.8)

The SNRs are provided in **Table 13**. Overall, the median SNR was 0.904 (95% CI: 0.733, 0.999) for the six hospital-affiliated facility groups. The minimum SNR was 0.719 and the maximum SNR was 0.953. The SNRs increased over time from 2018 to 2023. The median SNR for 2023, which is most reflective of current performance, was 0.885 (95% CI: 0.646, 0.999) for the six hospital-affiliated facility groups. The minimum SNR was 0.570 and the maximum SNR was 0.926 in 2023.

The SNRs were more reliable for the years 2022 and 2023, which had substantially larger sample sizes accounting for 56% of the data used for the analysis. The median SNRs in 2022 and 2023 indicated that a high proportion of overall variability was explained by the differences between measured entities (i.e., hospital-

affiliated facility groups) in those years. The increased median SNR and narrower confidence intervals can be attributed to larger sample sizes and increased variability between facility groups in 2022 and 2023.

Table 13. Signal-to-Noise Ratios, Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Median SNR (95% CI)	Minimum SNR	Maximum SNR
Overall	0.904 (0.733, 0.999)	0.719	0.953
2018	0.497 (0.185, 0.809)	0.328	0.727
2019	0.647 (0.191, 0.999)	0.248	0.794
2020	0.743 (0.355, 0.999)	0.307	0.829
2021	0.773 (0.394, 0.999)	0.364	0.872
2022	0.833 (0.502, 0.999)	0.457	0.905
2023	0.885 (0.646, 0.999)	0.570	0.926

The overall Spearman's rank correlation coefficient was 0.83 (95% CI: -0.03, 0.98) (**Table 14**), indicating a strong positive correlation between the test and validation samples. The increased correlation can be attributed to increased variability between hospital-affiliated facility groups in 2020. However, the 95% CI is very wide given that only six facility groups were included in the analysis. Additional facility group data is required to generate narrower confidence intervals.

Table 14. Spearman's Rank Correlation Coefficients, Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Test-Validation Correlation	95% CI
Overall	0.83	(-0.03, 0.98)
2018	0.14	(-0.76, 0.85)
2019	0.09	(-0.78, 0.84)
2020	0.90	(0.24, 0.99)
2021	0.77	(-0.18, 0.97)
2022	0.37	(-0.65, 0.90)
2023	0.37	(-0.65, 0.90)

The overall ICC was 0.021 (95% CI: 0.006, 0.386) in the test sample and 0.010 (95% CI: 0.003, 0.388) in the validation sample (**Table 15**). There were no apparent trends over time. The overall ICCs were low, indicating that a low proportion of variation in the facility group level scores was due to facility group level signal variation. Notably, the 95% CIs were very wide given that only six facility groups were included in the analysis. Additional facility group data is required to generate narrower confidence intervals.

Table 15. Interclass Correlation Coefficients (ICC), Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Test Sample (95% CI)	Validation Sample (95% CI)
Overall	0.021 (0.006, 0.386)	0.010 (0.003, 0.388)
2018	0.178 (0.056, 0.324)	0.029 (0.005, 0.999)
2019	0.184 (0.055, 0.328)	0.183 (0.056, 0.327)
2020	0.031 (0.007, 0.947)	0.180 (0.054, 0.322)
2021	0.185 (0.057, 0.334)	0.016 (0.003, 0.977)
2022	0.035 (0.009, 0.772)	0.002 (0.000, 0.999)
2023	0.048 (0.013, 0.692)	0.036 (0.008, 0.895)

APPENDIX 2: 90-day Follow-up Rates and Accountable-entity Level Reliability Testing

Health System 1 had an overall integrated delivery system 90-day follow-up colonoscopy rate of 40.1% (95% CI: 38.7, 41.4). Health System 2 had an overall 90-day follow-up colonoscopy rate of 43.7% (95% CI: 40.8, 46.5).

The facility group rates by year for Health System 1 are presented in **Table 16**.

Table 16. eCQM Rates by Year for 6 Hospital-affiliated Facility Groups at **Health System 1**

Measurement Year	eCQM Rate of Timely Diagnostic Resolution (95% CI)					
	Facility Group 1	Facility Group 2	Facility Group 3	Facility Group 4	Facility Group 5	Facility Group 6
Overall	25.2 (20.4, 29.9)	39.3 (34.5, 44.0)	41.0 (38.2, 43.7)	39.4 (36.7, 42.1)	42.8 (40.2, 45.4)	46.6 (39.2, 54.0)
2018	36.8 (15.2, 58.5)	47.6 (26.3, 69.0)	41.8 (30.9, 52.7)	46.6 (33.7, 59.4)	50.5 (41.1, 59.8)	52.2 (31.8, 72.6)
2019	57.1 (31.2, 83.1)	41.3 (27.1, 55.5)	54.0 (45.3, 62.8)	45.8 (40.0, 53.7)	50.3 (42.3, 58.4)	50.0 (30.8, 69.2)
2020	30.0 (13.6, 46.4)	22.9 (9.0, 36.8)	30.0 (22.1, 37.9)	39.4 (30.0, 48.8)	41.2 (32.2, 50.3)	43.8 (19.4, 68.1)
2021	22.6 (11.4, 33.9)	47.2 (35.7, 58.8)	41.3 (35.1, 47.5)	41.2 (34.2, 48.1)	45.7 (39.8, 51.7)	39.1 (19.2, 59.1)
2022	25.5 (16.7, 34.4)	43.0 (33.6, 52.4)	39.3 (33.8, 44.8)	30.8 (25.7, 36.0)	37.5 (31.9, 43.2)	45.7 (29.2, 62.2)
2023	19.0 (11.8, 26.1)	34.1 (25.9, 42.3)	41.4 (36.4, 46.5)	41.3 (36.9, 45.8)	40.3 (35.7, 44.9)	47.2 (33.7, 60.6)

The SNRs are provided in **Table 17**. Overall, the median SNR was 0.905 (95% CI: 0.736, 0.999) for the six hospital-affiliated facility groups. The minimum SNR was 0.719 and the maximum SNR was 0.953. The SNRs increased over time from 2020 to 2023. The median SNR for 2023, which is most reflective of current performance, was 0.898 (95% CI: 0.631, 0.999) for the six hospital-affiliated facility groups. The minimum SNR was 0.556 and the maximum SNR was 0.921 in 2023.

The SNRs were more reliable for the years 2022 and 2023, which had substantially larger sample sizes accounting for 56% of the data used for the analysis. The median SNR in 2023 indicated that a high proportion of overall variability was explained by the differences between measured entities (i.e., hospital-affiliated facility groups) that year. The increased median SNR and narrower confidence intervals can be attributed to larger sample sizes and increased variability between hospital-affiliated facility groups in 2023.

Table 17. Signal-to-Noise Ratios (SNR), Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Median SNR (95% CI)	Minimum SNR	Maximum SNR
Overall	0.905 (0.736, 0.999)	0.719	0.953
2018	-	-	-
2019	-	-	-
2020	0.211 (-0.008, 0.430)	0.055	0.355
2021	0.212 (-0.033, 0.457)	0.048	0.363
2022	0.548 (0.156, 0.941)	0.184	0.697
2023	0.898 (0.631, 0.999)	0.556	0.921

The overall Spearman's rank correlation coefficient was 0.94 (95% CI: 0.49, 0.99), indicating a strong positive correlation between the test and validation samples, despite a lack of variability between hospital-affiliated facility groups within each year. However, the 95% CI is very wide given that only six facility groups were included in the analysis. Additional facility group data is required to generate narrower confidence intervals.

Table 18. Spearman's Rank Correlation Coefficients, Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Test-Validation Correlation	95% CI
Overall	0.94	(0.49, 0.99)
2018	0.03	(-0.80, 0.82)
2019	-0.14	(-0.85, 0.76)
2020	0.49	(-0.57, 0.92)
2021	0.03	(-0.80, 0.82)
2022	0.71	(-0.30, 0.96)
2023	0.26	(-0.71, 0.88)

The overall ICC was 0.024 (95% CI: 0.007, 0.330) in the test sample and 0.014 (95% CI: 0.004, 0.384) in the validation sample (**Table 19**). There were no apparent trends over time. The overall ICCs were low, indicating that a low proportion of variation in the facility group level scores was due to facility group level signal variation. Notably, the 95% CIs were very wide given that only six facility groups were included in the analysis. Additional facility group data is required to generate narrower confidence intervals.

Table 19. Interclass Correlation Coefficients (ICC), Overall and by Year from 2018 to 2023 for Six Facility Groups in **Health System 1**

Measurement Year	Test Sample (95% CI)	Validation Sample (95% CI)
Overall	0.024 (0.007, 0.330)	0.014 (0.004, 0.384)
2018	0.198 (0.057, 0.355)	0.180 (0.054, 0.325)
2019	0.179 (0.051, 0.316)	0.195 (0.061, 0.346)
2020	0.041 (0.009, 0.903)	0.178 (0.055, 0.320)
2021	0.179 (0.058, 0.321)	0.037 (0.008, 0.941)
2022	0.030 (0.008, 0.675)	0.001 (0.000, 0.999)
2023	0.026 (0.006, 0.753)	0.050 (0.014, 0.734)