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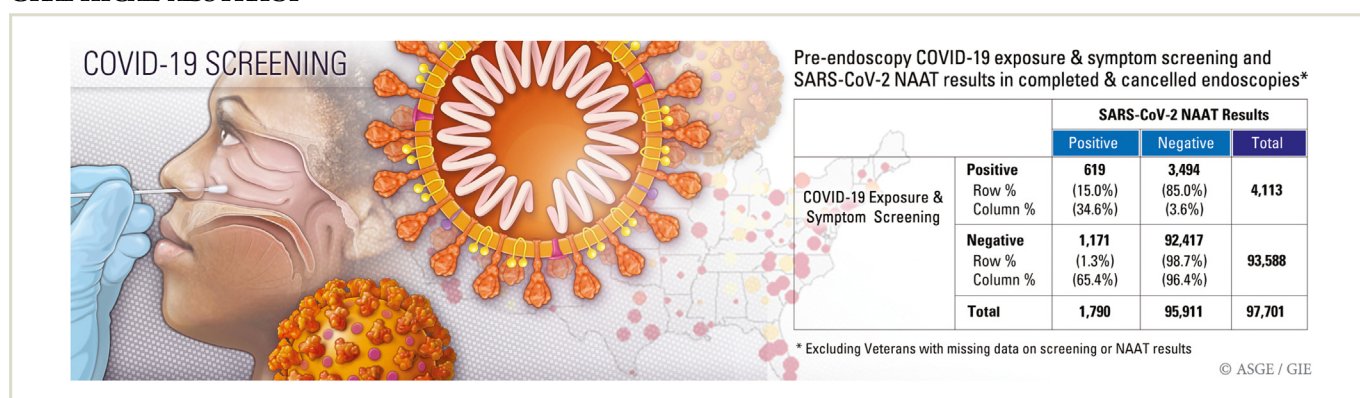


# Pre-endoscopy coronavirus disease 2019 screening and severe acute respiratory syndrome coronavirus-2 nucleic acid amplification testing in the Veterans Affairs healthcare system: clinical practice patterns, outcomes, and relationship to procedure volume

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## GRAPHICAL ABSTRACT



**Background and Aims:** The coronavirus disease 2019 (COVID-19) pandemic has had profound impacts worldwide, including on the performance of GI endoscopy. We aimed to describe the performance and outcomes of pre-endoscopy COVID-19 symptom and exposure screening and severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) nucleic acid amplification testing (NAAT) across the national Veterans Affairs healthcare system and describe the relationship of SARS-CoV-2 NAAT use and resumption of endoscopy services.

**Methods:** COVID-19 screening and NAAT results from March 2020 to April 2021 were analyzed to determine use, performance characteristics of screening, and association between testing and endoscopic volume trends.

**Results:** Of 220,891 completed endoscopies identified, 115,890 (52.5%) had documented preprocedure COVID-19 symptom and exposure screenings and 154,127 (69.8%) had preprocedure NAAT results within 7 days before scheduled endoscopy. Of 131,894 total canceled endoscopies, 26,475 (20.1%) had screening data and 28,505 (21.6%) had SARS-CoV-2 NAAT results. Overall, positive NAAT results were reported in 1.8% of all individuals tested and in 1.3% of those who screened negative. Among completed and canceled endoscopies, COVID-19 screening had a 34.6% sensitivity (95% confidence interval [CI], 32.4%-36.8%) and 96.4% specificity (95% CI, 96.2%-96.5%) when compared with NAAT. COVID-19 screening had a positive predictive value of 15.0% (95% CI, 14.0%-16.1%) and a negative predictive value of 98.7% (95% CI, 98.7%-98.8%). There was a very weak correlation between monthly testing and monthly endoscopy volume by site (Spearman rank correlation coefficient = .09).

**Conclusions:** These findings have important implications for decisions about preprocedure testing, especially given breakthrough infections among vaccinated individuals during the SARS-CoV-2 delta and omicron variant surge. (Gastrointest Endosc 2022;96:423-32.)

(footnotes appear on last page of article)

The coronavirus disease 2019 (COVID-19) pandemic has had a profound impact on elective procedures, including GI endoscopy.<sup>1,2</sup> Early in the pandemic, the Veterans Health Administration acted quickly to cease all elective procedures, prioritizing the safety of veterans and staff, but this ultimately resulted in significant deferment of care.<sup>2,3</sup> As the pandemic persisted, organizations, including the Veterans Health Administration, developed detailed guidance for resumption of care, including GI endoscopy.<sup>4</sup> This guidance set minimum standards for infection control precautions (eg, personal protective equipment [PPE]) based on patient risk stratification and procedure risk (eg, aerosol generation).<sup>5,6</sup> The protocols and recommendations developed in response to COVID-19 were based on rapidly evolving evidence and expert consensus. Key components of risk assessment for procedures included screening for presence of symptoms suggestive of COVID-19<sup>7</sup> (based on the Centers for Disease Control and Prevention guidance<sup>8</sup>), risk of potential exposure to contacts with COVID-19, and, if available, pre-procedural severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) nucleic acid amplification testing (NAAT).

Preprocedure testing guidance has evolved over the course of the pandemic. In July 2020, a rapid systematic review and guideline found that a pre-endoscopy testing strategy in asymptomatic individuals could be useful, depending on the local prevalence of the disease.<sup>9</sup> In addition to helping with infection prevention and control, pre-endoscopy testing could provide reassurance to patients, staff, and endoscopists and inform decisions regarding PPE.<sup>10-12</sup> The guidance also highlighted the downsides of a pre-endoscopy testing strategy, which included additional system, provider, and patient burden related to testing logistics.<sup>13</sup> Updated guidance in May 2021, which preceded the current SARS-CoV-2 delta variant surge, included consideration of postvaccination status and conditional recommendations to cease routine SARS-CoV-2 testing before endoscopy as a systematic review found asymptomatic prevalence and transmission to be very low and assumed centers had adequate access to PPE and universal screening protocols.<sup>14</sup>

The Veterans Health Administration comprises 170 medical facilities and 1074 outpatient sites serving over 6 million veterans annually,<sup>15</sup> accounting for approximately 400,000 endoscopy visits annually before the pandemic. To ensure safe resumption of care during the pandemic, the Veterans Health Administration instituted a universal screening protocol for COVID-19 symptoms or exposure before permitting entry into medical facilities. Many endoscopy units implemented formal preprocedure screening via telephone (with documentation in the electronic health record) and SARS-CoV-2 NAAT before the endoscopy appointment.

As the largest integrated healthcare system in the United States, there is an opportunity to learn from the Veterans Health Administration's nationwide experiences as the pandemic continues. The objectives of this evaluation are to describe the real-world results from a strategy

of pre-endoscopy COVID-19 symptom and exposure screening and SARS-CoV-2 NAAT across the national Veterans Affairs (VA) healthcare system, including prevalence of asymptomatic infection among veterans undergoing endoscopy and the sensitivity and specificity of COVID-19 screening, and to geographically illustrate the use of pre-endoscopy SARS-CoV-2 NAAT and explore its association with endoscopy procedure volumes across the Veterans Health Administration.

## METHODS

### Approvals

The findings reported in this publication were conceived and conducted as a VA nonresearch operations activity. The results and report have been approved for submission as a nonresearch activity in accordance with VA Office of Research & Development Guide 1200.21.<sup>16</sup>

### Data sources

The Biosurveillance, Antimicrobial Stewardship & Infection Control program developed and validated a source code to evaluate pre-endoscopy SARS-CoV-2 NAAT results from the VA National Surveillance Tool<sup>17</sup> housed within the VA Corporate Data Warehouse. The VA Clinical Assessment, Reporting, and Tracking<sup>18</sup> program refined the code to extract outpatient VA endoscopies and SARS-CoV-2 NAAT results around procedure dates.

### Cohort definitions

We included all veterans undergoing outpatient colonoscopy or EGD from March 18, 2020 through April 30, 2021 at any VA facility. These procedures were identified using Current Procedural Terminology codes (available online at [www.giejournal.org](http://www.giejournal.org)) from administrative data.

Because abnormal COVID-19 screening and/or NAAT results would likely result in canceled appointments, it was necessary to identify all canceled GI endoscopy appointments. Existing data systems do not permit determination of the reason for cancellation, such as abnormal NAAT, patient preference, or other reasons. To minimize cancellations for other reasons, we only included those endoscopy appointments that were canceled within 7 days of the scheduled appointment date because this corresponded to the timeframe of preprocedure screening and testing. Although most appointments in the endoscopy clinic are for colonoscopy or EGD, we could not definitively exclude appointments for other uncommon indications (eg, esophageal pH testing). VA uses 3-digit codes to classify outpatient specialty clinics,<sup>19</sup> including endoscopy. However, some small facility sites perform endoscopy in the operating room. With these limitations in mind, we used the following 2 approaches to define canceled endoscopies because of COVID-19.

First, our primary ("inclusive") approach aimed to optimize sensitivity at the risk of lower specificity. The

inclusive approach included all clinics that had at least 1 completed endoscopy within the clinic during calendar years 2019 to 2020 and either a clinic code for endoscopy assigned to the clinic or more than 50% of the completed visits within the clinic resulted in endoscopy.

Second, as part of a sensitivity analysis, a second (“conservative”) approach was used that likely captured fewer true endoscopy appointments (lower sensitivity) but reduced the number of false positives (higher specificity). The conservative approach only included clinic locations where 10% or more of the completed endoscopies at the facility occurred at the clinic and 75% or more of the completed visits at the clinic resulted in endoscopy.

### Pre-endoscopy COVID-19 screening

Documentation of preprocedure COVID-19 symptom and exposure screening was identified using data generated from a nationally standardized COVID-19 screening tool implemented in the VA electronic health record (Supplementary Fig. 1, available online at [www.giejournal.org](http://www.giejournal.org)). Text string searches were used to extract structured data correlating to the standard template that were then classified into categories for screen results (positive or negative), exposure (yes or no), travel (yes or no), flu (yes or no), cough (yes or no), and fever (yes or no). The “screen results” category was used to flag positive screens; however, if this information was not available, any “yes” response to exposure, travel, flu, cough, or fever was identified as a positive screen. Documentation of screening was restricted to 7 days before endoscopy. Screening the day of the procedure or before was considered screening before endoscopy. If multiple screening data were available during the pre-endoscopy period, any positive result was used first. Otherwise, the result closest to the date of the procedure was included in the analysis.

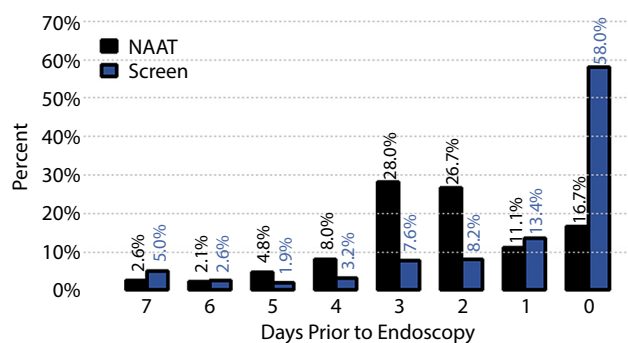
### SARS-CoV-2 NAAT results

SARS-CoV-2 NAAT results are documented in the electronic health record and were collected from the testing datasets generated by the Biosurveillance, Antimicrobial Stewardship & Infection Control program from the VA Corporate Data Warehouse. Additionally, documentation of positive tests from the community were collected from clinical notes using natural language processing.<sup>20</sup> Like screening, if multiple test results were available during the 7-day pre-endoscopy period, any positive result was used first, followed by the result closest to the procedure.

### Analyses and outcomes

Descriptive and analytical statistics using R (version 4.0.3) were performed to determine the following findings:

- The overall and individual facility implementation and pre-endoscopy timing of COVID-19 screening and exposure and SARS-CoV-2 NAAT results.



**Figure 1.** Timing of preprocedure coronavirus disease 2019 screening and severe acute respiratory syndrome coronavirus-2 NAAT results in completed endoscopies. Denominator for % calculation is total number of endoscopies with screening and NAAT performed, respectively; 47.5% of endoscopies did not have documented screening, whereas 30.2% of endoscopies did not have NAAT results. NAAT, Nucleic acid amplification testing.

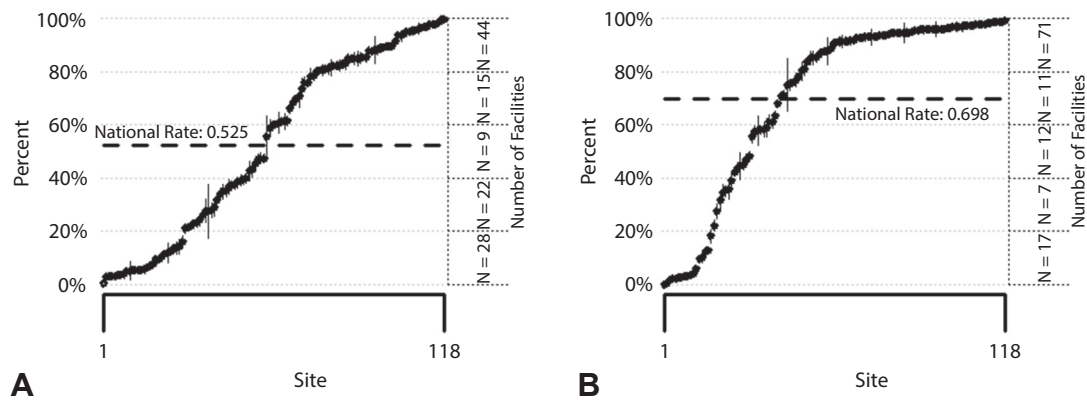
- COVID-19 screening and SARS-CoV-2 NAAT results within 7 days before a completed or canceled endoscopy. To explore the effect of missing data, a sensitivity analysis was also performed limiting data to sites in the top 50% of lowest missing rates for both screening and NAAT results.
- Geographic location, endoscopy volume, and proportion of patients with NAAT illustrated with geographic information system maps and correlation explored between volume and testing using a within-cluster resampling approach.<sup>21</sup>

## RESULTS

### Implementation of preprocedure screening and testing

Between March 18, 2020 and April 30, 2021, we identified 220,891 completed outpatient endoscopies at 118 VA facilities. Facility volume ranged from 76 to 7654 endoscopies over the 13.5-month time frame. Of the completed endoscopies, 115,890 (52.5%) had documented preprocedure COVID-19 symptom and exposure screening, and 154,127 (69.8%) had preprocedure SARS-CoV-2 NAAT results within 7 days before the procedure. In addition, 83,165 procedures (37.6%) had both documented preprocedure screening and testing, and 34,039 procedures (15.4%) had neither documented preprocedure screening nor testing. As shown in Figure 1, most (82.5%) preprocedure SARS-CoV-2 NAAT results were obtained within 3 days of the procedure, whereas screening was most commonly (58.0%) documented on the day of the procedure (day 0).

During the same time frame, we identified 26,475 canceled appointments with screening data and 28,505 canceled appointments with SARS-CoV-2 NAAT data out of 131,894 total canceled appointments (20.1% and 21.6%, respectively). There were 14,536 canceled appointments



**Figure 2. A,** Proportion of endoscopy procedures with documented screening for coronavirus disease 2019 symptoms or severe acute respiratory syndrome coronavirus-2 exposure by Veterans Affairs facility March 2020 to April 2021. **B,** Proportion of procedures with severe acute respiratory syndrome coronavirus-2 nucleic acid amplification testing results by Veterans Affairs facility March 2020 to April 2021.

**TABLE 1. COVID-19 screening and SARS-CoV-2 NAAT results in completed endoscopies, March 2020 to April 2021**

		SARS-CoV-2 NAAT results			Total
		Positive	Negative	Missing	
COVID-19 screening	Positive	31	1652	313	1996
	Row %	1.6	82.8	15.7	
	Column %	7.5	1.1	.5	
	Negative	191	81,291	32,412	113,894
	Row %	.2	71.4	28.5	
	Column %	46.2	52.9	48.5	
	Missing	191	70,771	34,039	105,001
	Row %	.2	67.4	32.4	
	Column %	46.2	46.0	51.0	
	Total	413	153,714	66,764	220,891

COVID-19, Coronavirus disease 2019; NAAT, nucleic acid amplification testing; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2.

with both screening and SARS-CoV-2 NAAT data (11.0%). As shown in Figure 2, there was significant variation in the proportion of procedures with documented screening and SARS-CoV-2 NAAT results across VA facilities.

**Preprocedure screening and SARS-CoV-2 NAAT results in completed and canceled procedures**

Tables 1 and 2 show the overall results for COVID-19 screening and SARS-CoV-2 NAAT results in completed and canceled endoscopies. Of 115,890 completed procedures for which there were screening data, 1996 patients (1.7%) screened positive. Of 26,475 canceled endoscopies with screening data, 3029 patients (11.4%) screened positive. Of 154,127 completed procedures with SARS-CoV-2 NAAT results, 413 patients (.3%) had positive NAAT results. These 413 positive SARS-CoV-2 tests using NAAT occurred across 90 sites, and the remaining 28 sites had no positive tests pre-endoscopy. Of 28,505 canceled endoscopies with SARS-CoV-2 NAAT data, 2878 patients (10.1%) were NAAT

positive. Among the 2878 canceled endoscopies with positive SARS-CoV-2 NAAT results, 588 patients (20.4%) had documented positive screening, 980 (34.1%) had documented negative screening, and 1310 (45.5%) did not have screening documented.

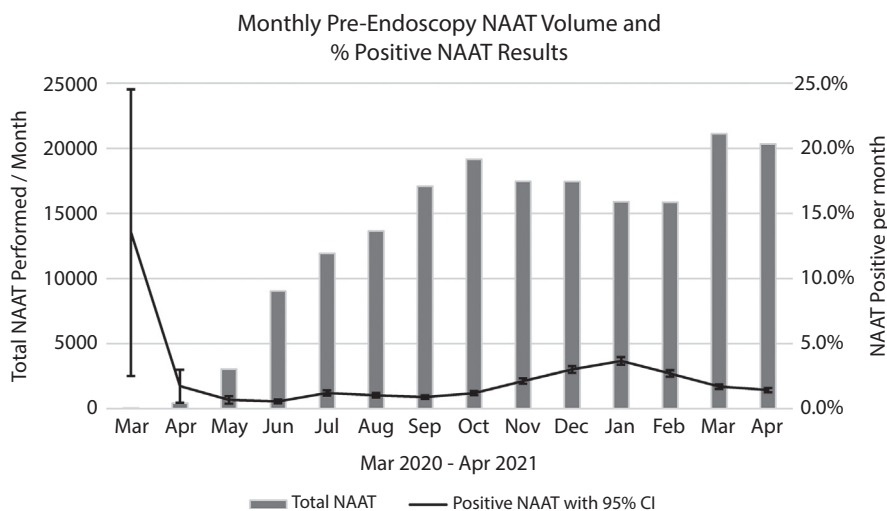
Figure 3 shows the monthly pre-endoscopy NAAT volume (completed and canceled procedures combined) and positive NAAT per month. Only 37 pre-endoscopy tests were performed in March 2020, followed by an increase in testing volume over the following months. Testing volume reached a peak in March 2021 with 21,136 NAAT performed pre-endoscopy. Excluding March 2020 data, the proportion of positive NAAT results per month ranged from .5% in June 2020 to a high of 3.7% in January 2021. The proportion of positive tests per month increased through January 2021 with a subsequent decline in April 2021 to 1.4%.

Using SARS-CoV-2 NAAT results as the reference standard, we estimated the performance of preprocedure

**TABLE 2. COVID-19 screening and SARS-CoV-2 NAAT results in canceled endoscopies (using inclusive definition of canceled endoscopies)**

		SARS-CoV-2 NAAT results			Total
		Positive	Negative	Missing	
COVID-19 screening	Positive	588	1842	599	3029
	Row %	19.4	60.8	19.8	
	Column %	20.4	7.2	.6	
	Negative	980	11,126	11,340	23,446
	Row %	4.2	47.5	48.4	
	Column %	34.1	43.4	11.0	
	Missing	1310	12,659	91,450	105,419
	Row %	1.2	12.0	86.7	
	Column %	45.5	49.4	88.5	
Total		2878	25,627	103,389	131,894

COVID-19, Coronavirus disease 2019; NAAT, nucleic acid amplification testing; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2.



**Figure 3.** Monthly pre-endoscopy nucleic acid amplification testing (NAAT) volume and % positive NAAT, March 2020 to April 2021. *CI*, Confidence interval.

screening using data from all canceled and completed endoscopies for which there was both screening and polymerase chain reaction data (Table 3). Positive NAAT results were reported in 1.8% of all individuals tested and in 1.3% of those who screened negative. Among those patients who had positive SARS-CoV-2 NAAT results, 34.6% also screened positive for COVID-19 (ie, screening sensitivity, 34.6%; 95% confidence interval [CI], 32.4%-36.8%). The specificity of screening was 96.4% (95% CI, 96.2%-96.5%). Conversely, among those patients with positive COVID-19 screening, 15.0% had a positive NAAT result (screening positive predictive value, 15.0%; 95% CI, 14.0%-16.1%). The negative predictive value of screening was 98.7% (95% CI, 98.7%-98.8%). Using the conservative definition of canceled endoscopies did not appreciably change these results, with 429 NAAT-positive patients screening

positive (32.9% of 1303 patients with NAAT-positive results). The NAAT positivity rate in screen-positive patients using the conservative definition was 13.6% (429 NAAT positive of 3154 patients who screened positive).

A sensitivity analysis limited to the sites in the top 50% with the least missing data for both screening and NAAT results included 91,494 (25.9% of the primary cohort) completed or canceled appointments at 30 sites. The sensitivity analysis cohort for completed endoscopies had a missing rate of 17% for screening data and 5% for NAAT results compared with 48% and 30%, respectively, in the primary cohort. When considering completed and canceled endoscopy appointments combined, screening data were missing in 38% and NAAT results were missing in 29% compared with 60% and 48%, respectively, in the primary cohort. No clinically significant change was found in the

**TABLE 3. COVID-19 screening and SARS-CoV-2 NAAT results in completed and canceled endoscopies (inclusive definition) and COVID-19 screening test performance\***

		SARS-CoV-2 NAAT results		
		Positive	Negative	Total
COVID-19 screening	Positive	619	3494	4113
	Row %	15.0	85.0	
	Column %	34.6	3.6	
	Negative	1171	92,417	93,588
	Row %	1.3	98.7	
	Column %	65.4	96.4	
	Total	1790	95,911	97,701

COVID-19, Coronavirus disease 2019; NAAT, nucleic acid amplification testing; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2.

\*Excluding veterans with missing data on screening or NAAT results.

test performance results or proportion of patients with negative or positive screening or NAAT results in the top 50% of sites with the least missing screening and NAAT results (Supplementary Tables 1 and 2, available online at [www.giejournal.org](http://www.giejournal.org)).

### Geographic and facility endoscopy volume compared with proportion of patients with pre-endoscopy SARS-CoV-2 NAAT

The average 30-day endoscopy volume was determined in relation to the proportion of patients with preprocedure SARS-CoV-2 testing in completed endoscopies. Figure 4 shows geographic information system trend maps to visualize endoscopy volume and the proportion of patients tested over time. By December 2020, most endoscopy sites used SARS-CoV-2 NAAT before endoscopy. There was a very weak correlation between monthly testing and monthly endoscopy volume by site across the Veterans Health Administration using a within-cluster resampling approach (Spearman rank correlation coefficient = .09) (Supplementary Fig. 2, available online at [www.giejournal.org](http://www.giejournal.org)).<sup>21</sup> Using data on completed procedures through April 2021, 71 sites (60.2%) completed testing in 80% to 100% of procedures, accounting for 120,952 total procedures (54.8% of 220,891 total procedures performed). During the same time frame, 17 sites (14.4%) were testing 0% to 20% of individuals pre-endoscopy, accounting for 32,002 total procedures (14.5% of total procedures performed) across the VA system.

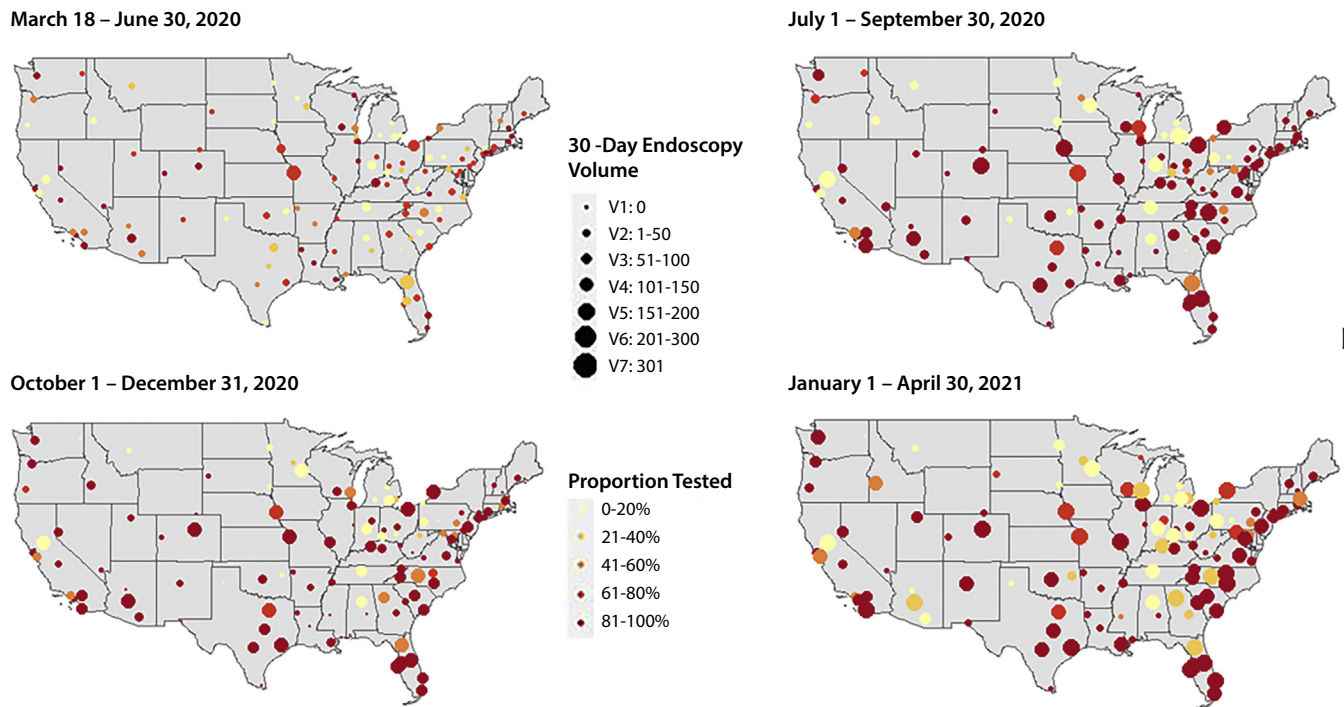
## DISCUSSION

The COVID-19 pandemic required swift adaptations in healthcare delivery in the United States and globally.<sup>2,22</sup> Although rapid growth in telemedicine mitigated negative effects for many specialties, procedure-based specialties, such as GI endoscopy, were significantly impacted.<sup>23,24</sup> This report describes the use of preprocedure COVID-19

symptom screening and viral testing before endoscopy, the outcomes of a pretesting strategy, and the temporal relationship with endoscopy volumes within the largest integrated healthcare system in the United States.

First and foremost, our data reveal remarkably rapid uptake of documented pre-endoscopy COVID-19 screening and viral testing across the VA healthcare system through April 2021. Screening was mandated by the VA and occurred at each facility entrance, although this screening was not documented in the electronic health record. Therefore, our data reflect additional pre-endoscopy screening that was documented in the electronic health record. Preprocedure testing was not mandated nationally, with local leadership providing risk assessment guidance for facilities. In individuals scheduled for elective endoscopy, this approach can reduce potential exposure to infection for staff and other patients. Screening for symptoms or exposures alone adds value, because those patients who screened positive had a 15.0% NAAT positivity rate. However, screening alone would have missed 65.4% of individuals found to have SARS-CoV-2 infection among those who had both SARS-CoV-2 NAAT and screening data reported.

Our data from over 300,000 procedure appointments show the uptake of preprocedure testing and documented screening as the pandemic spread across the United States. This likely helps explain our NAAT positivity rate of 15.0% in screen-positive patients, much higher than previously reported early in the pandemic. Two cost-effectiveness studies on pre-endoscopy testing and PPE use found that routine pre-endoscopy testing was more cost effective as the prevalence of COVID-19 increased.<sup>25,26</sup> Overall, 1.3% of endoscopy patients with negative screening tested positive for SARS-CoV-2, similar to an observational study recently reported from the Netherlands evaluating pre-endoscopy screening and testing before elective surgery.<sup>27</sup> Data early in the pandemic on pre-endoscopy SARS-CoV-2 testing and screening showed similarly high negative predictive value for symptom screening but low positive predictive



**Figure 4.** Average 30-day endoscopy volume and proportion of pre-endoscopy severe acute respiratory syndrome coronavirus-2 polymerase chain reaction testing in Veterans Affairs facilities during the coronavirus disease 2019 pandemic.

value.<sup>28-30</sup> These published studies were from single centers and reported results from the first few months of the pandemic (March to May 2020). Notably, another recent study reported on preprocedural SARS-CoV-2 testing at 3 academic hospitals and 19 community hospitals in Pennsylvania and New York during 3 different phases of the pandemic.<sup>31</sup> The prevalence of asymptomatic COVID-19 among individuals undergoing pre-endoscopy testing was .10% (10/10,539) from April 21 to June 11, 2020, .15% (54/34,948) from June 12 to September 10, 2020, and .41% (101/24,741) from September 11 to December 15, 2020. Our inclusion of patients with canceled appointments is important because failure to do so would underestimate the prevalence of COVID-19 infection in patients undergoing endoscopy in the absence of preprocedure testing. Of the procedures that were canceled in the VA system, 4.0% of patients with canceled procedures either had abnormal COVID-19 screening or NAAT results. Thus, we can only attribute cancellations to COVID-19 disease in a very small percentage of scheduled endoscopies.

Our results from the VA provide important information about the discriminative value of preprocedure COVID-19 screening and SARS-CoV-2 NAAT that can be used to optimize preprocedure protocols for endoscopy as the pandemic continues, driven by SARS-CoV-2 variants and variable vaccination status of patients across the country. The VA guidance provided detailed guidance on screening, testing, and PPE recommendations. For GI endoscopy, the guidance recommended N95 masks with eye protection or a powered air purifying respirator (PAPR) irrespective of

COVID-19 test status. If COVID-19 status was unknown, then the procedure room could not be used for another patient until enough air exchange occurred to meet infection prevention rules for downtime to clear the virus. This VA guidance likely helped encourage sites to adopt preprocedure testing. The variability in reported testing between sites could be due to a variety of reasons, such as test availability or local testing policy. There is also variability in the proportion of patients with documented screening. However, even if a preprocedural phone call was not performed or documented, any patient reporting symptoms or exposure would not be permitted entry to a VA facility except to receive care specific to that symptom or exposure. It is possible that VA requirements for symptom and exposure screening for entry into its facilities may have decreased the perceived importance of screening before arrival.

We hypothesized that facilities with greater access to NAAT may have been able to offer more endoscopic services. However, our results did not reveal evidence to support a meaningful correlation between endoscopy volume and use of pre-endoscopy NAAT. Multiple factors likely played a role in resuming endoscopy volume, including pre-endoscopy testing. We were also unable to measure staff availability, PPE availability, local leadership decisions regarding endoscopy services, and COVID-19 burden at individual sites. Preprocedural SARS-CoV-2 testing, although recommended, is not mandatory in VA sites. Variation in practice patterns may have been influenced by local factors including local COVID-19 epidemiology, NAAT availability,



turnaround time of test results, patient burden and acceptability, access to PPE, and staff and provider comfort level with no testing.<sup>9</sup> Although sites across the VA have some access to SARS-CoV-2 testing with rapid turnaround, the volume of rapid testing that can be accomplished varied from site to site, and some facilities may have opted to limit testing to high-risk aerosol-generating procedures (eg, EGDs), whereas others may have tested before all GI procedures. The ability to prioritize preprocedural testing for turnaround that is fast enough to allow for clinical decision-making (ie, postponement of the procedure) may be negatively impacted in areas where prevalence of SARS-CoV-2 is high and testing demands are also high. Smaller facilities may have less capacity for in-house testing, and turnaround time for nonurgent testing may be longer than the recommended 72-hour window.<sup>5</sup> Thus, any factor affecting time-to-result of SARS-CoV-2 testing limits the utility in a preprocedural risk assessment and may lead to a decision not to implement a preprocedure testing strategy. Furthermore, prevalence of COVID-19 in the community may influence test performance, and in areas of low prevalence, the false-positive rate may be an additional limitation to testing.

Recently updated guidance to stop COVID-19 testing before endoscopy was based on a systematic review finding very low rates of asymptomatic prevalence and transmission (0%-5%).<sup>14</sup> Between March and December 2020, 93,558 veterans with a negative COVID-19 screening underwent NAAT before endoscopy appointments, and 1.3% were positive. In the early months of the pandemic, there was much uncertainty on best practices as knowledge of the virus evolved, vaccine was not available, and there were significant shortages of PPE. Pre-endoscopy screening and testing provided benefits to inform PPE distribution for lower risk (nonaerosol-generating) procedures and allowed safe resumption of elective endoscopy by protecting and reassuring staff and patients. Our data show that symptom screening has a positive predictive value of 15.0% with a negative predictive value of 98.7% and supports continuation of this practice across VA sites before endoscopy, particularly given the relative ease of implementation compared with preprocedural testing.

Our report does have several limitations. First, we likely underestimated preprocedure screening because we were unable to capture episodes of screening that were not documented within the standard screening tool. However, use of a validated text processing workflow developed by the VA for COVID-19 surveillance was used to improve sensitivity.<sup>20</sup> Second, we did not explore screening and testing before advanced procedures, such as EUS and ERCP. Third, appointment data, used to identify canceled endoscopies, do not provide a clear intended purpose for the appointment, although misclassification would be unlikely to significantly alter our findings. Historically, VA has a cancellation rate of approximately 30%. At the onset of the pandemic, this rate peaked at over 70%

before returning to near-baseline levels in late 2020 (Supplementary Fig. 3, available online at [www.giejournal.org](http://www.giejournal.org)). Although we were unable to determine an exact reason for cancellation in most cases, the 4% cancellation rate attributed to COVID-19 represents a floor because others may have canceled because of COVID-19 concerns that were not reported. Next, we may have underestimated the use of pre-endoscopy SARS-CoV-2 NAAT if testing occurred outside of the VA. We only examined COVID-19 tests within 7 days of the procedure and did not measure or include NAAT done more than 7 days pre-endoscopy. NAAT performed before this time frame may have impacted clinical decision-making and added to the reasons for procedure cancellation. However, the overall U.S. population rate for COVID-19 remained at less than 5% of the population during this time and would likely have had little overall effect on cancellation rates in our study.<sup>32</sup> Finally, missing data on screening and NAAT could be nonrandom, leading to biased conclusions. It is reassuring that a sensitivity analysis that was restricted to 30 sites with the least missing data yielded very similar results.

This report has several strengths including a very large sample size spanning endoscopy centers that are geographically distributed throughout the United States, accounting for variability in COVID-19 prevalence across the nation and throughout the first 13.5 months of the pandemic. Furthermore, the inclusion of screening and testing data from canceled appointments is critical to estimating the impact on endoscopy services. The presence of varying practices regarding SARS-CoV-2 screening and testing, where testing policies are determined at the local level based on local risk analysis, illustrates generalizability and real-world applicability. Although practice settings differ within and outside the Veterans Health Administration, most healthcare systems have the ability to incorporate intake or preprocedure COVID-19 screening analogous to intake protocols that assess medication use and nil per os (NPO) status. SARS-CoV-2 testing availability does depend on local resources, including widespread availability of rapid antigen tests as an option for consideration.

In summary, we describe the results of pre-endoscopy COVID-19 screening and SARS-CoV-2 NAAT use in the VA healthcare system during the first 13.5 months of the pandemic. Numerous questions and areas of future study remain, including those surrounding unintended consequences related to pretesting requirements before receiving endoscopy care. For example, postponement of endoscopy may lead to poor patient outcomes, such as delayed cancer diagnoses.<sup>3,33</sup> Emergence of variant strains of the virus, such as delta and omicron, with decreased vaccine efficacy and asymptomatic transmission, has prolonged the course of the pandemic, necessitating careful evaluation of the role of screening and testing practices. Our findings can help inform decisions regarding the role of pre-endoscopy screening and testing. In fact, newly updated guidance

from the American Society of Anesthesiologists recommend that all patients undergoing an aerosolizing procedure (such as EGD) should continue to have preoperative polymerase chain reaction testing for SARS-CoV-2, ideally within 3 days of the procedure, irrespective of vaccination status.<sup>34</sup> Any perceived decrease in safe practices in endoscopy centers may lead to heightened anxiety among patients and staff, which could also negatively impact patients' willingness to undergo endoscopy and/or staff morale and performance.<sup>12</sup> This report illustrates 1 of many adaptations made within the VA as a learning healthcare system that seeks to continually generate and apply evidence and innovation to provide high-quality care during an unprecedented time as we continue into the second, and hopefully final, year of the COVID-19 pandemic.

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Abbreviations: COVID-19, coronavirus disease 2019; NAAT, nucleic acid amplification testing; PPE, personal protective equipment; SARS-

CoV-2, severe acute respiratory syndrome coronavirus-2; VA, Veterans Affairs.

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**Current Procedural Terminology (CPT) codes used to identify endoscopies in the VA healthcare System**

<b>CPTCODE</b>	<b>DESCRIPTION</b>
G9937	DIAGNOSTIC COLONOSCOPY
G9936	SURVEILLANCE COLONOSCOPY - PERSONAL HISTORY OF COLONIC POLYPS, COLON CANCER, OR OTHER MALIGNANT NEOPLASM OF RECTUM, RECTOSIGMOID JUNCTION, AND ANUS
G0121	COLORECTAL CANCER SCREENING; COLONOSCOPY ON INDIVIDUAL NOT MEETING CRITERIA FOR HIGH RISK
G0105	COLORECTAL CANCER SCREENING; COLONOSCOPY ON INDIVIDUAL AT HIGH RISK
74328	ENDOSCOPIC CATHETERIZATION OF THE BILIARY DUCTAL SYSTEM, RADIOLOGICAL SUPERVISION AND INTERPRETATION
45398	COLONOSCOPY, FLEXIBLE; WITH BAND LIGATION(S) (EG, HEMORRHOIDS)
45393	COLONOSCOPY, FLEXIBLE; WITH DECOMPRESSION (FOR PATHOLOGIC DISTENTION) (EG, VOLVULUS, MEGACOLON), INCLUDING PLACEMENT OF DECOMPRESSION TUBE, WHEN PERFORMED
45392	COLONOSCOPY, FLEXIBLE; WITH TRANSENDOSCOPIC ULTRASOUND GUIDED INTRAMURAL OR TRANSMURAL FINE NEEDLE ASPIRATION/BIOPSY(S), INCLUDES ENDOSCOPIC ULTRASOUND EXAMINATION LIMITED TO THE RECTUM, SIGMOID, DESCENDING, TRANSVERSE, OR ASCENDING COLON AND CECUM, AND ADJACENT STRUCTURES
45391	COLONOSCOPY, FLEXIBLE; WITH ENDOSCOPIC ULTRASOUND EXAMINATION LIMITED TO THE RECTUM, SIGMOID, DESCENDING, TRANSVERSE, OR ASCENDING COLON AND CECUM, AND ADJACENT STRUCTURES
45390	COLONOSCOPY, FLEXIBLE; WITH ENDOSCOPIC MUCOSAL RESECTION
45389	COLONOSCOPY, FLEXIBLE; WITH ENDOSCOPIC STENT PLACEMENT (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
45388	COLONOSCOPY, FLEXIBLE; WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S) (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
45386	COLONOSCOPY, FLEXIBLE; WITH TRANSENDOSCOPIC BALLOON DILATION
45385	COLONOSCOPY, FLEXIBLE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY SNARE TECHNIQUE
45384	COLONOSCOPY, FLEXIBLE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY HOT BIOPSY FORCEPS
45382	COLONOSCOPY, FLEXIBLE; WITH CONTROL OF BLEEDING, ANY METHOD
45381	COLONOSCOPY, FLEXIBLE; WITH DIRECTED SUBMUCOSAL INJECTION(S), ANY SUBSTANCE
45380	COLONOSCOPY, FLEXIBLE; WITH BIOPSY, SINGLE OR MULTIPLE
45379	COLONOSCOPY, FLEXIBLE; WITH REMOVAL OF FOREIGN BODY(S)
45378	COLONOSCOPY, FLEXIBLE; DIAGNOSTIC, INCLUDING COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING, WHEN PERFORMED (SEPARATE PROCEDURE)
45350	SIGMOIDOSCOPY, FLEXIBLE; WITH BAND LIGATION(S) (EG, HEMORRHOIDS)
45349	SIGMOIDOSCOPY, FLEXIBLE; WITH ENDOSCOPIC MUCOSAL RESECTION
45347	SIGMOIDOSCOPY, FLEXIBLE; WITH PLACEMENT OF ENDOSCOPIC STENT (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
45346	SIGMOIDOSCOPY, FLEXIBLE; WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S) (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
45342	SIGMOIDOSCOPY, FLEXIBLE; WITH TRANSENDOSCOPIC ULTRASOUND GUIDED INTRAMURAL OR TRANSMURAL FINE NEEDLE ASPIRATION/BIOPSY(S)
45341	SIGMOIDOSCOPY, FLEXIBLE; WITH ENDOSCOPIC ULTRASOUND EXAMINATION
45340	SIGMOIDOSCOPY, FLEXIBLE; WITH TRANSENDOSCOPIC BALLOON DILATION
45338	SIGMOIDOSCOPY, FLEXIBLE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY SNARE TECHNIQUE
45337	SIGMOIDOSCOPY, FLEXIBLE; WITH DECOMPRESSION OF VOLVULUS, ANY METHOD
45335	SIGMOIDOSCOPY, FLEXIBLE; WITH DIRECTED SUBMUCOSAL INJECTION(S), ANY SUBSTANCE
45334	SIGMOIDOSCOPY, FLEXIBLE; WITH CONTROL OF BLEEDING, ANY METHOD
45333	SIGMOIDOSCOPY, FLEXIBLE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY HOT BIOPSY FORCEPS
45332	SIGMOIDOSCOPY, FLEXIBLE; WITH REMOVAL OF FOREIGN BODY(S)
45331	SIGMOIDOSCOPY, FLEXIBLE; WITH BIOPSY, SINGLE OR MULTIPLE

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<b>CPTCODE</b>	<b>DESCRIPTION</b>
45330	SIGMOIDOSCOPY, FLEXIBLE; DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
44404	COLONOSCOPY THROUGH STOMA; WITH DIRECTED SUBMUCOSAL INJECTION(S), ANY SUBSTANCE
44403	COLONOSCOPY THROUGH STOMA; WITH ENDOSCOPIC MUCOSAL RESECTION
44401	COLONOSCOPY THROUGH STOMA; WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S) (INCLUDES PRE-AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
44394	COLONOSCOPY THROUGH STOMA; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY SNARE TECHNIQUE
44392	COLONOSCOPY THROUGH STOMA; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY HOT BIOPSY FORCEPS OR BIPOLAR CAUTERY
44391	COLONOSCOPY THROUGH STOMA; WITH CONTROL OF BLEEDING, ANY METHOD
44389	COLONOSCOPY THROUGH STOMA; WITH BIOPSY, SINGLE OR MULTIPLE
44388	COLONOSCOPY THROUGH STOMA; DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
44386	ENDOSCOPIC EVALUATION OF SMALL INTESTINAL POUCH (EG, KOCK POUCH, ILEAL RESERVOIR [S OR JJ]); WITH BIOPSY, SINGLE OR MULTIPLE
44385	ENDOSCOPIC EVALUATION OF SMALL INTESTINAL POUCH (EG, KOCK POUCH, ILEAL RESERVOIR [S OR JJ]); DIAGNOSTIC, INCLUDING COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING, WHEN PERFORMED (SEPARATE PROCEDURE)
44384	ILEOSCOPY, THROUGH STOMA; WITH PLACEMENT OF ENDOSCOPIC STENT (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
44382	ILEOSCOPY, THROUGH STOMA; WITH BIOPSY, SINGLE OR MULTIPLE
44381	ILEOSCOPY, THROUGH STOMA; WITH TRANSENDOSCOPIC BALLOON DILATION
44380	ILEOSCOPY, THROUGH STOMA; DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
44378	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, INCLUDING ILEUM; WITH CONTROL OF BLEEDING (EG, INJECTION, BIPOLAR CAUTERY, UNIPOLAR CAUTERY, LASER, HEATER PROBE, STAPLER, PLASMA COAGULATOR)
44377	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, INCLUDING ILEUM; WITH BIOPSY, SINGLE OR MULTIPLE
44376	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, INCLUDING ILEUM; DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
44373	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH CONVERSION OF PERCUTANEOUS GASTROSTOMY TUBE TO PERCUTANEOUS JEJUNOSTOMY TUBE
44372	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH PLACEMENT OF PERCUTANEOUS JEJUNOSTOMY TUBE
44370	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH TRANSENDOSCOPIC STENT PLACEMENT (INCLUDES PREDILATION)
44369	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S) NOT AMENABLE TO REMOVAL BY HOT BIOPSY FORCEPS, BIPOLAR CAUTERY OR SNARE TECHNIQUE
44366	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH CONTROL OF BLEEDING (EG, INJECTION, BIPOLAR CAUTERY, UNIPOLAR CAUTERY, LASER, HEATER PROBE, STAPLER, PLASMA COAGULATOR)
44365	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY HOT BIOPSY FORCEPS OR BIPOLAR CAUTERY
44364	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY SNARE TECHNIQUE
44363	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; DIAGNOSTIC, INCLUDING COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING, WHEN PERFORMED (SEPARATE PROCEDURE)
44361	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; WITH BIOPSY, SINGLE OR MULTIPLE
44360	SMALL INTESTINAL ENDOSCOPY, ENTEROSCOPY BEYOND SECOND PORTION OF DUODENUM, NOT INCLUDING ILEUM; DIAGNOSTIC, INCLUDING COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING, WHEN PERFORMED (SEPARATE PROCEDURE)

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<b>CPTCODE</b>	<b>DESCRIPTION</b>
43278	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S), INCLUDING PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED
43277	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH TRANS-ENDOSCOPIC BALLOON DILATION OF BILIARY/PANCREATIC DUCT(S) OR OF AMPULLA (SPHINCTEROPLASTY), INCLUDING SPHINCTEROTOMY, WHEN PERFORMED, EACH DUCT
43276	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH REMOVAL AND EXCHANGE OF STENT(S), BILIARY OR PANCREATIC DUCT, INCLUDING PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED, INCLUDING SPHINCTEROTOMY, WHEN PERFORMED, EACH STENT EXCHANGED
43275	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH REMOVAL OF FOREIGN BODY(S) OR STENT(S) FROM BILIARY/PANCREATIC DUCT(S)
43274	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH PLACEMENT OF ENDOSCOPIC STENT INTO BILIARY OR PANCREATIC DUCT, INCLUDING PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED, INCLUDING SPHINCTEROTOMY, WHEN PERFORMED, EACH STENT
43270	ESOPHAGOGASTRODUODENOSCOPY, FLEXIBLE, TRANSORAL; WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S) (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
43266	ESOPHAGOGASTRODUODENOSCOPY, FLEXIBLE, TRANSORAL; WITH PLACEMENT OF ENDOSCOPIC STENT (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
43265	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH ENDOSCOPIC RETROGRADE DESTRUCTION, LITHOTRIPSY OF CALCULUS/CALCULI, ANY METHOD
43264	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH REMOVAL OF CALCULI/DEBRIS FROM BILIARY/PANCREATIC DUCT(S)
43262	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH SPHINCTEROTOMY/PAPILLOTOMY
43261	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); WITH BIOPSY, SINGLE OR MULTIPLE
43260	ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP); DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
43259	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH ENDOSCOPIC ULTRASOUND EXAMINATION, INCLUDING THE ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE
43257	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH DELIVERY OF THERMAL ENERGY TO THE MUSCLE OF LOWER ESOPHAGEAL SPHINCTER AND/OR GASTRIC CARDIA, FOR TREATMENT OF GASTROESOPHAGEAL REFLUX DISEASE
43255	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH CONTROL OF BLEEDING, ANY METHOD
43254	ESOPHAGOGASTRODUODENOSCOPY, FLEXIBLE, TRANSORAL; WITH ENDOSCOPIC MUCOSAL RESECTION
43253	ESOPHAGOGASTRODUODENOSCOPY, FLEXIBLE, TRANSORAL; WITH TRANSENDOSCOPIC ULTRASOUND-GUIDED TRANSMURAL INJECTION OF DIAGNOSTIC OR THERAPEUTIC SUBSTANCE(S) (EG, ANESTHETIC, NEUROLYTIC AGENT) OR FIDUCIAL MARKER(S) (INCLUDES ENDOSCOPIC ULTRASOUND EXAMINATION OF THE ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM OR A SURGICALLY ALTERED STOMACH WHERE THE JEJUNUM IS EXAMINED DISTAL TO THE ANASTOMOSIS)
43252	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH OPTICAL ENDOMICROSCOPY
43251	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY SNARE TECHNIQUE
43250	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY HOT BIOPSY FORCEPS OR BIPOLAR CAUTERY
43249	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH BALLOON DILATION OF ESOPHAGUS (LESS THAN 30 MM DIAMETER)
43248	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH INSERTION OF GUIDE WIRE FOLLOWED BY DILATION OF ESOPHAGUS OVER GUIDE WIRE
43247	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH REMOVAL OF FOREIGN BODY
43246	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH DIRECTED PLACEMENT OF PERCUTANEOUS GASTROSTOMY TUBE

*(continued on the next page)*

**Continued**

<b>CPTCODE</b>	<b>DESCRIPTION</b>
43245	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH DILATION OF GASTRIC OUTLET FOR OBSTRUCTION (EG, BALLOON, GUIDE WIRE, BOUGIE)
43244	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH BAND LIGATION OF ESOPHAGEAL AND/OR GASTRIC VARICES
43243	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH INJECTION SCLEROSIS OF ESOPHAGEAL AND/OR GASTRIC VARICES
43242	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH TRANSENDOSCOPIC ULTRASOUND-GUIDED INTRAMURAL OR TRANSMURAL FINE NEEDLE ASPIRATION/BIOPSY(S) (INCLUDES ENDOSCOPIC ULTRASOUND EXAMINATION OF THE ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE)
43241	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH TRANSENDOSCOPIC INTRALUMINAL TUBE OR CATHETER PLACEMENT
43240	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH TRANSMURAL DRAINAGE OF PSEUDOCYST
43239	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH BIOPSY, SINGLE OR MULTIPLE
43238	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH TRANSENDOSCOPIC ULTRASOUND-GUIDED INTRAMURAL OR TRANSMURAL FINE NEEDLE ASPIRATION/BIOPSY(S), ESOPHAGUS (INCLUDES ENDOSCOPIC ULTRASOUND EXAMINATION LIMITED TO THE ESOPHAGUS)
43237	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH ENDOSCOPIC ULTRASOUND EXAMINATION LIMITED TO THE ESOPHAGUS
43236	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; WITH DIRECTED SUBMUCOSAL INJECTION(S), ANY SUBSTANCE
43235	UPPER GASTROINTESTINAL ENDOSCOPY INCLUDING ESOPHAGUS, STOMACH, AND EITHER THE DUODENUM AND/OR JEJUNUM AS APPROPRIATE; DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
43233	ESOPHAGOGASTRODUODENOSCOPY, FLEXIBLE, TRANSORAL; WITH DILATION OF ESOPHAGUS WITH BALLOON (30 MM DIAMETER OR LARGER) (INCLUDES FLUOROSCOPIC GUIDANCE, WHEN PERFORMED)
43232	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH TRANSENDOSCOPIC ULTRASOUND-GUIDED INTRAMURAL OR TRANSMURAL FINE NEEDLE ASPIRATION/BIOPSY(S)
43231	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH ENDOSCOPIC ULTRASOUND EXAMINATION
43229	ESOPHAGOSCOPY, FLEXIBLE, TRANSORAL; WITH ABLATION OF TUMOR(S), POLYP(S), OR OTHER LESION(S) (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
43227	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH CONTROL OF BLEEDING (EG, INJECTION, BIPOLAR CAUTERY, UNIPOLAR CAUTERY, LASER, HEATER PROBE, STAPLER, PLASMA COAGULATOR)
43226	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH INSERTION OF GUIDE WIRE FOLLOWED BY DILATION OVER GUIDE WIRE
43220	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH BALLOON DILATION (LESS THAN 30 MM DIAMETER)
43217	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH REMOVAL OF TUMOR(S), POLYP(S), OR OTHER LESION(S) BY SNARE TECHNIQUE
43215	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH REMOVAL OF FOREIGN BODY
43214	ESOPHAGOSCOPY, FLEXIBLE, TRANSORAL; WITH DILATION OF ESOPHAGUS WITH BALLOON (30 MM DIAMETER OR LARGER) (INCLUDES FLUOROSCOPIC GUIDANCE, WHEN PERFORMED)
43213	ESOPHAGOSCOPY, FLEXIBLE, TRANSORAL; WITH DILATION OF ESOPHAGUS, BY BALLOON OR DILATOR, RETROGRADE (INCLUDES FLUOROSCOPIC GUIDANCE, WHEN PERFORMED)
43212	ESOPHAGOSCOPY, FLEXIBLE, TRANSORAL; WITH PLACEMENT OF ENDOSCOPIC STENT (INCLUDES PRE- AND POST-DILATION AND GUIDE WIRE PASSAGE, WHEN PERFORMED)
43211	ESOPHAGOSCOPY, FLEXIBLE, TRANSORAL; WITH ENDOSCOPIC MUCOSAL RESECTION
43210	ESOPHAGOGASTRODUODENOSCOPY, FLEXIBLE, TRANSORAL; WITH ESOPHAGOGASTRIC FUNDOPLASTY, PARTIAL OR COMPLETE, INCLUDES DUODENOSCOPY WHEN PERFORMED
43206	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH OPTICAL ENDOMICROSCOPY
43205	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH BAND LIGATION OF ESOPHAGEAL VARICES
43204	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH INJECTION SCLEROSIS OF ESOPHAGEAL VARICES
43202	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH BIOPSY, SINGLE OR MULTIPLE

(continued on the next page)

**Continued**

CPTCODE	DESCRIPTION
43201	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; WITH DIRECTED SUBMUCOSAL INJECTION(S), ANY SUBSTANCE
43200	ESOPHAGOSCOPY, RIGID OR FLEXIBLE; DIAGNOSTIC, WITH OR WITHOUT COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING (SEPARATE PROCEDURE)
43198	ESOPHAGOSCOPY, FLEXIBLE, TRANSNASAL; WITH BIOPSY, SINGLE OR MULTIPLE
43197	ESOPHAGOSCOPY, FLEXIBLE, TRANSNASAL; DIAGNOSTIC, INCLUDING COLLECTION OF SPECIMEN(S) BY BRUSHING OR WASHING, WHEN PERFORMED (SEPARATE PROCEDURE)

**VA Coronavirus Disease 2019 (COVID-19) Screen – Reminder dialog template**

Complete COVID-19 Screen

Record the patient's response to the following question: (check all that apply or none at the end)

In the last 14 days have you had new onset of any of the following symptoms?

- Chills
- Cough
- Diarrhea
- Fatigue
- Fever
- Headache
- Loss of taste or smell
- Muscle pain (myalgias)
- Nausea
- Runny nose (rhinorrhea)
- Shortness of breath (dyspnea)
- Sore throat)
- Vomiting
- No symptoms

Within the last 14 days, have you had:

- Close exposure (within 6 feet for more than 15 minutes) to someone with a febrile/respiratory illness
- Close exposure (within 6 feet for more than 15 minutes) to someone with known or suspected case of COVID-19
- No known exposure

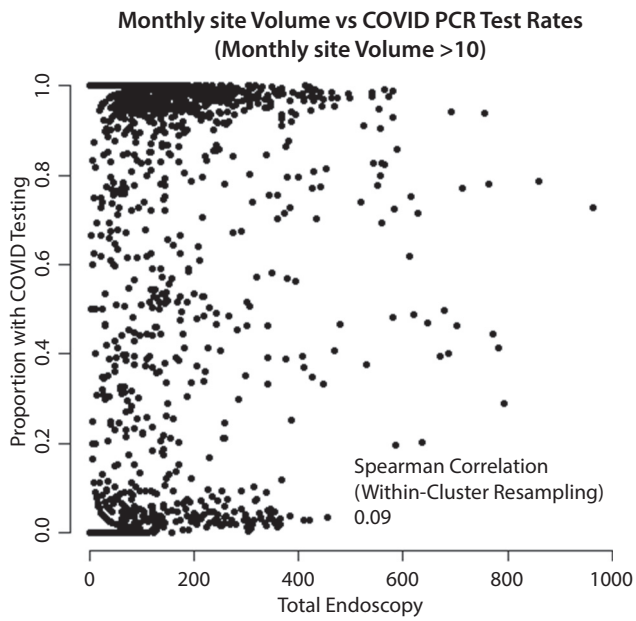
Any symptom or exposure equal to positive screen

- Patient has a positive symptom or exposure and requires further evaluation
- Screen in negative

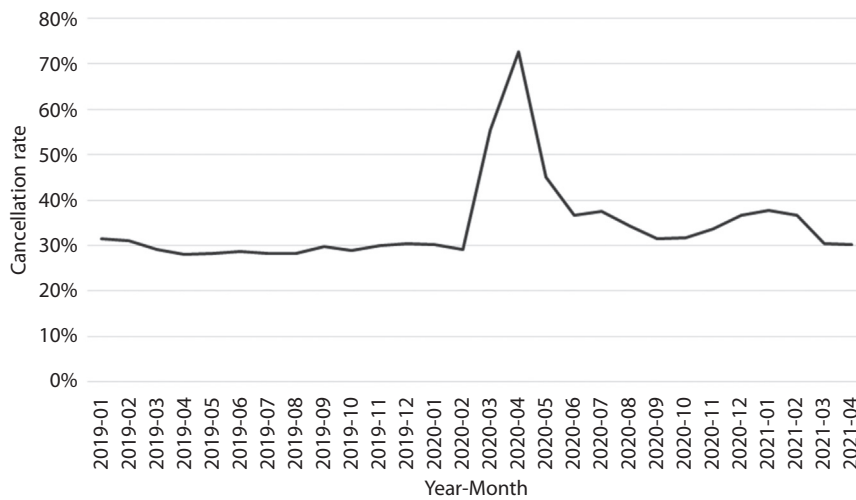
- Patient is waiting on COVID-19 test results
- Patient reports prior COVID-19 Diagnosis
- Unable to answer

**Supplementary Figure 1.** Screenshot of VA COVID-19 screening tool in the electronic health record. VA, Veterans Affairs.





**Supplementary Figure 2.** Correlation plot between monthly nucleic acid amplification testing use and monthly endoscopy volume by site using a within-cluster-resampling approach. *COVID*, Coronavirus disease 2019; *PCR*, polymerase chain reaction.



**Supplementary Figure 3.** Veterans Affairs endoscopy appointment cancellation rate from January 2019 to April 2021.

**SUPPLEMENTARY TABLE 1. Coronavirus disease 2019 screening performance compared with NAAT for the primary cohort and a subpopulation of the top 50% of sites with least missing screening and NAAT data (including both completed and canceled [inclusive definition] endoscopy appointments)**

	Primary cohort results	Top 50% sites with least missing data
No. of records	352,785	91,494
No. of sites	118	30
No. with screening and NAAT data	97,701	52,932
Screening sensitivity, %	.35 (.32-.37)	.33 (.30-.37)
Screening specificity, %	.96 (.96-.97)	.98 (.97-.98)
Screening positive predictive value, %	.15 (.14-.16)	.17 (.16-.19)
Screening negative predictive value, %	.99 (.98-.99)	.99 (.99-.99)

Values in parentheses are 95% confidence intervals.

NAAT, Nucleic acid amplification testing.

**SUPPLEMENTARY TABLE 2. COVID-19 screening and SARS-CoV-2 NAAT results in completed and canceled endoscopies (inclusive definition) and COVID-19 screening test performance\***

		SARS-CoV-2 NAAT results					
		Primary analysis cohort			Sensitivity analysis cohort		
		Positive	Negative	Total	Positive	Negative	Total
Screening	Positive	619	3494	4113	250	1185	1435
	Row %	15	85		17.4	82.6	
	Column %	34.6	3.6		33.3	2.3	
	Negative	1171	92,417	93,588	500	50,997	51,497
	Row %	1.3	98.7		1.0	99.0	
	Column %	65.4	96.4		66.7	97.7	
	Total	1790	95,911	97,701	750	52,182	52,932

Sensitivity analysis cohort is limited to sites in the top 50% with least missing screening and NAAT data.

COVID-19, Coronavirus disease 2019; NAAT, nucleic acid amplification testing; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2.

\*Excluding veterans with missing data on screening or NAAT results.