



METHODOLOGY

Why Every Hospital Needs a COVID-19 Clinical Case Review Team

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Abstract

A hospital's response to a global pandemic requires a coordinated effort to provide consistent guidance, as information rapidly changes. In the early months of the COVID-19 pandemic, diagnosis and subsequent containment was challenging due to unfamiliarity with disease presentation, unknown reverse transcription-polymerase chain reaction sensitivity and inconsistent access to testing supplies. A centralized COVID-19 clinical case review team can provide guidance on test interpretation, isolation, resource coordination and more.

Background

Several factors have led to the rapid spread of SARS-CoV-2 including transmission by asymptomatic carriers, delays in mandatory social distancing, and lack of testing capabilities. Concerns have been raised over false negative reverse transcription-polymerase chain reaction (RT-PCR) results contributing to the COVID-19 pandemic. [1] False negative SARS-CoV-2 RT-PCR tests may be due to poor specimen collection technique, three target primers, or early clearance of SARS-CoV-2 from nasopharyngeal samples. [2,3] The lack of ability to adequately test patients is especially significant in hospitals where patients may infect healthcare workers who in turn may infect other vulnerable patients. [4,5] At Norton Healthcare, early experience with an obvious false negative nasopharyngeal swab case lead to the creation of a multidisciplinary, centralized, COVID-19 clinical case review team to analyze inpatient COVID-19 test results. This report describes the role and functions of the COVID-19 clinical case review team at Norton Healthcare.

Approach

COVID-19 Clinical Command Center and Case Review Team

Norton Healthcare is a 1500+ bed community health care system with four adult and one pediatric hospitals located in Louisville, Kentucky. Norton Healthcare created the COVID-19 clinical command center on March 14, 2020. Within the COVID-19 clinical command center, a team of clinical pharmacy specialists in infectious diseases, a radiologist, and an infectious diseases physician was formed to review COVID-19 RT-PCR test results. The role of the COVID-19 clinical case review team was to provide guidance to frontline providers on the interpretation of negative coronavirus test results, make isolation recommendations to the infection prevention team, and make treatment recommendations using best available evolving literature. The broad reaching impact of the COVID-19 case review team is outlined in **Figure 1**.

Case Review Process

At Norton Healthcare, we use a broad approach to COVID-19 testing and isolating by allowing any inpatient provider to order a SARS-CoV-2 RT-PCR with a linked order to isolate the patient. This broad approach to testing and isolating under any clinical suspicion allows Norton Healthcare to stay ahead of epidemiologic trends. By allowing providers to test for COVID-19 cases at will, our COVID-19 clinical case review team is able to gath-

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Figure 1. Scope of the Norton Healthcare’s Centralized COVID-19 Clinical Case Review Team

	High risk Exposure	Symptoms/labs c/w COVID-19	Alternative explanation
Low	-	+	+
Indeterminate	+	-	+/-
	-	+	-
High	+	+	+/-

Figure 2. COVID-19 Case Review - Clinical Suspicion Algorithm.

er surveillance information on changing epidemiologic or clinical presentation based on provider’s clinical suspicion.

Subsequently, the clinical case review team reviews all adult inpatients with pending COVID-19 tests each day. The case review consists of a radiographic and clinical review. Chest CTs were recommended at Norton Healthcare on all adult inpatients with suspected COVID-19 disease due to the higher specificity than clinical presentation of COVID-19 disease. [6] The radiologist discusses cases with the infectious diseases pharmacists to identify timeline of the CT in relation to symptom presentation, and other comorbidities that could explain abnormal findings on CT. The radiologist then designates the patient’s radiographic review as high, indeterminate, or low risk of being COVID-19 disease.

The infectious diseases pharmacist or physician perform an independent clinical review of the patient. Their chart review consists of three areas: epidemiological risk, signs/symptoms consistent with COVID-19 disease, and alternative explanation for clinical presentation. Based on the presence or absence of these three areas, the clinical reviewer would use the grid outlined in **Figure 2** to designate the clinical review as high, indeterminate, or low risk of COVID-19 disease.

The radiographic and clinical reviews are then combined using **Figure 3** to estimate the patient’s overall risk of having COVID-19 disease as high, indeterminate, or low. This comprehensive case review is completed prior to the COVID-19 test result being available. If the patient’s test results as positive, the patient is managed as such. If the patient’s test result is negative, the clinical case review team’s assessment is communicated to the healthcare team through a progress

		Radiographic Suspicion		
		Low	Indeterminate	High
Clinical Suspicion	Low	Remove from COVID-19 isolation	Remove from COVID-19 isolation	Keep in COVID-19 isolation
	Indeterminate	Remove from COVID-19 isolation	Keep in COVID-19 isolation	Keep in COVID-19 isolation
	High	Keep in COVID-19 isolation	Keep in COVID-19 isolation	Keep in COVID-19 isolation

Green = low risk of false negative SARS-CoV-2 RT-PCR test. Yellow = intermediate risk of false negative SARS-CoV-2 RT-PCR test. Red = high risk of false negative SARS-CoV-2 RT-PCR test.

Figure 3. COVID-19 Isolation Recommendations with Negative COVID-19 Test

Negative COVID-19 Test Interpretation Guidance

Due to risk of false negative COVID-19 test results, Norton Healthcare has created a COVID-19 case review team. Using epidemiologic, clinical, and radiographic findings, the following recommendations have been made for this patient.

- This patient is at HIGH RISK for having COVID-19 disease at this time.
- Isolation status will remain in COVID-19 appropriate isolation.

The COVID-19 case review team consists of infectious diseases physician, infectious diseases pharmacist, and radiologist input. The purpose of the team is to identify a possible false negative COVID-19 test result in the changing COVID-19 pandemic.

Figure 4. Example Documentation from Norton Healthcare COVID-19 Clinical Case Review Team

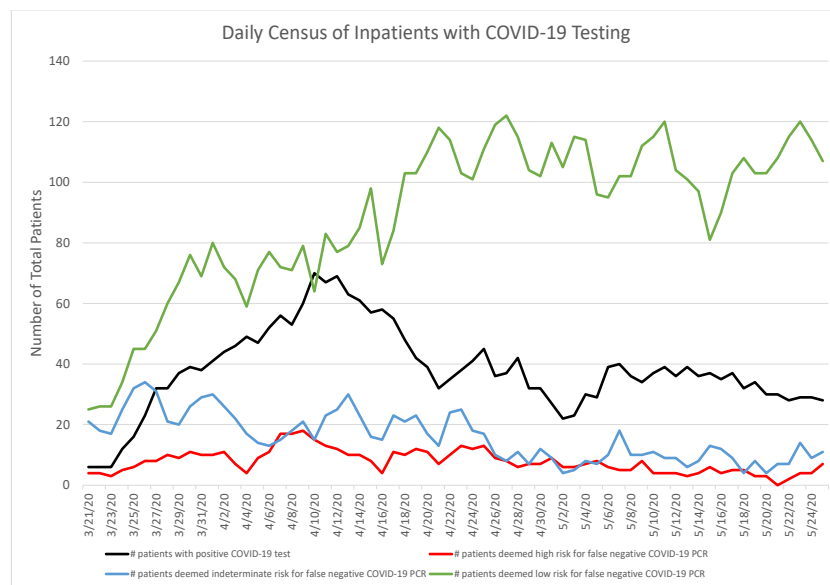


Figure 5. Daily Census of Inpatients with COVID-19 Testing at Norton Healthcare

note in the chart. If the assessment is low probability of a false negative test result, the negative test result is accepted as is and the recommendation is to remove from COVID-19 appropriate isolation. If the team's assessment is indeterminate of having COVID-19, the patient remains in COVID-19 appropriate isolation until further information is available. If the assessment is a high probability of a false negative test result, the patient is managed as if the test result is positive. An example documentation of a patient at high risk of having COVID-19 is seen in **Figure 4**.

Figure 5 illustrates the impact of the clinical case review process on the distribution of patients with a laboratory diagnosis of COVID-19 versus a clinical diagnosis of COVID-19. On average, 62% of our COVID-19 patients were diagnosed via RT-PCR and 38% of our COVID-19 patients had a clinical diagnosis of COVID-19 as defined by having a negative RT-PCR but deemed high risk of false negative or indeterminate risk of false negative. Of the 38% COVID-19 patients with a clinical diagnosis, on average approximately one-third were classified as high risk of false negative and two-thirds were classified as indeterminate risk of false negative.

The COVID-19 clinical case review team follows suspected COVID-19 patients throughout their hospitalization. Follow up activities include making recommendations on pharmacologic treatment and safety monitoring, screening candidates for participation in clinical trials, and ordering repeat COVID-19 testing either to clear the patient from isolation or to make a definitive diagnosis.

Discussion

Many benefits have been actualized from the Norton Healthcare COVID-19 clinical case review team. The first is reduction in patients being removed from isolation inappropriately. During the early days of the pandemic, many providers were eager to rule out COVID-19 cases with a single negative nasopharyngeal sample. Given that so little is known about varied presentation of COVID-19 disease, a multidisciplinary approach is necessary. At our hospitals, only infection preventionists can remove patients from isolation. Through partnership with the COVID-19 clinical case review team, we are able to provide a standardized approach to assessing risk of false negative SARS-CoV-2 RT-PCR test results. Additionally, we are able to quickly identify patients who are being tested for COVID-19 that are not in the necessary isolation.

Another benefit of the COVID-19 clinical case review team is the ability to adapt to the changing epidemiology of the pandemic. Exposure risk factors can change almost daily as certain populations may experience small-scale outbreaks of COVID-19 such as nursing homes, dialysis centers, or even groups within the community. By having a central team reviewing a large number of cases each day, we are able to rapidly identify changes and work with public health officials to identify trends. Our central team is also able to adjust our risk stratification based on learning through test results. Since inception, our assessment grids have been modified to better identify potential cases seen within our hospitals.

The last benefit seen with our process is a central coordination center for data and resource monitoring. Our centralized approach is able to track and follow trends of inpatient resource utilization, which can be matched to PPE supply and medication supplies. If a dire shortage of PPE was trending, we would be able to quickly adapt to recommend more patients be removed from isolation with a negative test.

There are several limitations to our approach. The first is that it is time consuming and resource intense to review every patient being worked up for COVID-19. We are fortunate to have a group of dedicated individuals that were willing to participate in a rotation to review patients seven days a week. The ability to test every suspected patient may not be feasible at all hospitals due to limited testing capacity. Our approach with providers to use the "see something, say something" method allowed us to stay ahead of epidemiologic trends. Institutions that are not able to test at will should at least consider isolating any suspected COVID-19 patients. The non-specific clinical presentation and widespread transmissibility of SARS-CoV-2 makes strict testing criteria challenging to implement.

Secondly, our approach to assessing negative test results was not in concordance with the CDC recommendations. Our conservative approach may have led to some unnecessary use of PPE resources and may not be feasible in other centers depending on PPE availability. However, our priority was to protect our healthcare workers that in turn protects our community.

Lastly, our approach of having a clinical and radiographic review is difficult to extrapolate to pediatric populations where chest CTs are not routinely used. Fortunately, COVID-19 has not been as prevalent in hospitalized pediatric patients.

In conclusion, the Norton Healthcare COVID-19 clinical case review team approach to monitoring inpatient COVID-19 testing provides a standardized, adaptable, multidisciplinary, and patient centric approach to managing the coronavi-

rus pandemic. Institutions may consider a centralized approach with resources adapted to their institution's needs.

Appendix: Center of Excellence for Research in Infectious Diseases (CERID) COVID-19 Study Group

The aforementioned appendix is available upon request.

References

1. Winichakoon P, Chaiwarith R, Liwsrisakun C, Salee P, Goonna A, Limsukon A, et al. Negative nasopharyngeal and oropharyngeal swabs do not rule out COVID-19. *J Clin Microbiol*. 2020 Apr;58(5):e00297–20. <https://doi.org/10.1128/JCM.00297-20> PMID:32102856
2. Tahamtan A, Ardebili A. Real-time RT-PCR in COVID-19 detection: issues affecting the results. *Expert Rev Mol Diagn*. 2020 May;20(5):453–4. <https://doi.org/10.1080/14737159.2020.1757437> PMID:32297805
3. CDC.gov. Fact sheet for healthcare providers: 2019-nCoV real-time RT-PCR diagnostic panel [fact sheet on the Internet]. Atlanta: Centers for Disease Control and Prevention; 2020 [updated 2020 Jun 12; cited 2020 Mar 15]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/downloads/Factsheet-for-Healthcare-Providers-2019-nCoV.pdf>
4. Sun Y, Koh V, Marimuthu K, Ng OT, Young B, Vasoo S, et al. Epidemiologic and clinical predictors of COVID-19. *Clin Infect Dis*. 2020 Mar 25. <https://doi.org/10.1093/cid/ciaa322>.
5. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med*. 2020 Mar;382(13):1199–207. <https://doi.org/10.1056/NEJMoa2001316> PMID:31995857
6. Feng H, Liu Y, Lv M, Zhong J. A case report of COVID-19 with false negative RT-PCR test: necessity of chest CT. *Jpn J Radiol*. 2020 May;38(5):409–10. <https://doi.org/10.1007/s11604-020-00967-9> PMID:32266524