JAMDA 22 (2021) 2034–2035

JAMDA

journal homepage: www.jamda.com

Letter to the Editor

Rethinking Positive Coronavirus Results: Interpreting RT-PCR Testing in Nursing Home Residents

A 66-year-old female nursing home resident with a history of advanced frontotemporal and vascular dementia [stage 7f on the Functional Assessment Staging Tool (FAST)] presented with fatigue, fever, anorexia, and tachypnea in the setting of a facility COVID-19 outbreak. On April 22, 2020, her reverse transcription–polymerase chain reaction (RT-PCR) returned positive for SARS-CoV-2. She was started on acetaminophen, intravenous (IV) fluids, and IV ceftriaxone given leukocytosis (white blood cell count = $17 \times 10^3/\mu L$) and concerns of concomitant pneumonia. Within 4 weeks, the patient's dyspnea and fever had resolved and her chronic dysphagia and episodic apnea had improved to baseline. Her medical history included hypothyroidism dating back to 1991 and a cerebellar vascular accident in 2015. The patient's only medication was levothyroxine (Synthroid), which she took as permitted by her severe dysphagia. The patient's physical examination was notable for extreme contracture of her legs and hands and nonverbal status (no longer responded to her name), which rendered a thorough review of systems impossible. She was deemed to have made a clinical recovery from COVID-19 by May 28, 2020. Repeat RT-PCR testing was not performed. The patient's health was stable until November 2020, when she developed fever and tachypnea with chest radiograph findings consistent with a right lower lobe aspiration pneumonia treated with ceftriaxone and metronidazole. Her dysphagia gradually worsened during this time, with 7.2-lb weight loss and intermittent use of IV fluid for dehydration consistent with goals of care.

On February 1, 2021 (285 days following the initial PCR test), a SARS-CoV-2 RNA Rapid test (Accula) returned positive during surveillance testing after a single resident on the unit tested positive. All staff tested negative at that time. Given no clear exposure, staff suspected that the PCR test was a residual false positive, so an antigen test (BD Veritor) was performed and was negative. Owing to the patient's fragile state, the family was very concerned that moving the patient would exacerbate her poor swallow and hasten her demise; however, out of abundance of precaution, the patient was moved to an isolation unit. Repeat antigen tests (BD Veritor) were negative on February 3, 2021 and February 4, 2021, and a repeat RT-PCR test (Cepheid) was negative on February 4, 2021. At this time, the patient was returned to her room.

RT-PCR diagnostic tests work through their ability to amplify tiny amounts of viral RNA. Though these tests are widely considered the gold standard for diagnosing COVID-19, they are occasionally suspect to false negatives, false positives, and amplification errors. Pinsky et al[1] determined the Accula SARS-CoV-2 test to have more false negatives than an alternative RT-PCR test (Stanford Healthcare EUA laboratory-developed test), particularly when the viral load was low. False positives were not observed in this study, but a false positive could occur if the assay detects another, similar virus: the CDC recommends the use of 100 consecutive nucleotide bases for diagnostics for viral infections, whereas probes in COVID-19 RT-PCR tests are only 25 base pairs in length.[2] Alternatively, a false positive could occur through amplification errors. Mei et al[3] found that among 651 community dwellers (median age 56.0 years) recovered from COVID-19, 23 patients (3%) continued to test positive by RT-PCR over a median follow-up of 48 days (maximum 91 days) even though no new viral transmission could be ascribed. RT-PCR is incapable of discerning infectious RNA from noninfectious RNA. Viral RNA has been detected after clinical recovery in other viral diseases, including SARS-CoV and MERS-CoV, and attributed to slow degradation of nucleic acids from tissues despite viral neutralization.[4] It is plausible that in severely debilitated patients, degradation is slowed and residual viral components remain longer, which may explain how our patient tested positive 285 days post-diagnosis. The role of antibody testing, though intriguing, is not yet sufficiently developed to differentiate acute vs subacute COVID-19 illness.

Despite clear COVID-19 protocols dictating that nursing home residents who test positive for SARS-CoV-2 be moved to an isolation ward, moving such a frail patient as ours was arguably pyrrhic in nature. The uncertainty as to whether the RT-PCR represented a new infection presented an ethical dilemma for providers and staff who were deeply concerned about the potential psychosocial harms of moving a patient near the end of life and the known harms of allowing a patient with active COVID-19 to remain on the unit. Achieving person-centered care while effectively managing a COVID-19 nursing home outbreak is extremely challenging. Nursing home staff should consider the nuances of the SARS-CoV-2 tests as well as the potential harms of isolating severely frail residents near the end of life while managing such outbreaks.

References

1. Hogan C, Garamani N, Pinsky B, et al. Comparison of the Accula SARS-CoV-2 test with a laboratory-developed assay for detection of SARS-CoV-2 RNA in clinical nasopharyngeal specimens. J Clin Microbiol 2020;58:e01072-20.
2. Lee SH. Testing for SARS-CoV-2 in cellular components by routine nested RT-PCR followed by DNA sequencing. Int J Geriatr Rehab 2020;2:69–96.
3. Mei Q, Li J, Du R, et al. Assessment of patients who tested positive for COVID-19 after recovery. Lancet Infect Dis 2020;20:1004–1005.

The authors have no conflicts of interest to declare. S.D.B. receives funds for mentoring related to this work (Funding: NIA K24 AG070106).

https://doi.org/10.1016/j.jamda.2021.07.023

4. Atkinson B, Petersen E. SARS-CoV-2 shedding and infectivity. Lancet 2020;395:1339–1340.

Scott A. Whitney, BS
Marcus Institute for Aging Research
Hebrew SeniorLife
Boston, MA, USA

Sarah D. Berry, MD
Marcus Institute for Aging Research
Hebrew SeniorLife
Boston, MA, USA

Beth Israel Deaconess Medical Center and Harvard Medical School
Boston, MA, USA