Total compliance for central-line bundle insertion and maintenance elements was 79% at baseline and 97% after implementation of the CLABSI prevention plan. Results from the baseline and post-intervention audits for line insertion elements found compliance regarding indication for line insertion to be 90% (9 of 10 patients) at baseline and 100% (10 of 10 patients) after the intervention. Compliance with optimal insertion site remained at 100% (10 of 10 patients). Compliance with maximum barriers, hand hygiene, and CHG prep were observed for 10 of 10 patients at baseline and for 10 of 10 patients after the intervention. As for line maintenance elements, compliance with daily assessment of need at baseline was 90% (9 of 10 patients) and 95% (61 of 64 patients) after the intervention. Compliance with CHG bathing occurred in 0 of 10 patients at baseline and increased to 59 (92%) of 64 patients after the intervention. Compliance with dressing changes every 7 days was 100% (10 of 10 patients) at baseline and 92% (59 of 64 patients) after the intervention. Lastly, CHG patch or disc use occurred in 8 (80%) 10 patients audited at baseline and 63 (98%) of 64 patients after the intervention.

Discussion

Our results showed improvements in reducing our CLABSI events in 2020. After 1 month of implementing the CLABSI prevention plan, our CLABSI rates decreased and remain at zero for the rest of the year. In addition, the overall compliance with line insertion and maintenance bundle elements increased an average of 18%. Compliance with line insertion elements improved or was maintained at 100% from baseline. Notably, after the intervention, all insertion elements had 100% compliance. As for line maintenance elements, compliance with daily assessment of line need, CHG patch or disc use, and CHG bathing all improved. An alternative product to CHG was used for bathing before the intervention, so compliance for this element was 0% at baseline. After the CLABSI prevention plan was implemented, compliance was 93%, making it our biggest improvement.

From retrospective chart review of CLABSI events in 2020, all occurred >5 days after insertion. According to The Joint Commission, this finding suggests that lapses in infection prevention in line maintenance occurred rather than lapses in insertion techniques.[4]

We were able to reduce CLABSI events at our LTACH to zero after implementing an ongoing plan comprising multidisciplinary teamwork, central-line insertion and maintenance bundle elements, caregiver education, and audits. More research is needed to determine the direct effect of each part of the CLABSI prevention plan on reducing rates. This experience demonstrates the potential impact of these prevention elements when combined.

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References

1. Haddadin Y, Annamaraju P, Regunath H. Central-line–associated blood stream infections. In: *StatPearls*. Treasure Island, FL: StatPearls Publishing; 2022.
2. Central-line–associated bloodstream infections. Centers for Disease Control and Prevention website. https://arpsp.cdc.gov/profile/infections/CLABSI. Published April 2020. Accessed February 25, 2022.
3. Guide to preventing central-line–associated bloodstream infections. Association for Professionals in Infection Control and Epidemiology website. https://apic.org/Resource_/TinyMceFileManager/2015/APIC_CLABSI_WEB.pdf. Published 2015. Accessed April 30, 2020.
4. CVC maintenance bundles. The Joint Commission website. https://www.jointcommission.org/-/media/tjc/documents/resources/clabsi/clabsi_toolkit_tool_3-22_cvc_maintenance_bundles.pdf?db=web&hash=DEBDCB7FB282A93419C47E4162ABA3A5. Published November 2013. Accessed February 25, 2022.

Ventilated patient headboards in the postanesthesia care unit as an alternative to universal preprocedural severe acute respiratory coronavirus virus 2 (SARS-CoV-2) testing

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To the Editor—The Infectious Diseases Society of America (IDSA) recommends preprocedural severe acute respiratory syndrome coronavirus virus 2 (SARS-CoV-2) testing prior to major surgery only to prevent adverse patient outcomes,[1] as long as personal protective equipment (PPE) is readily available for all participating healthcare workers. In reality, testing is conducted much more broadly. Consequences of such testing include costs and inconvenience incurred by patients and postponement of necessary procedures due to either a positive test (which may represent remote infection) or inability to obtain timely results.

One concern that has made scaling back universal preprocedural testing difficult is the potential for transmission of the virus between patients in the postanesthesia care unit (PACU), which is nearly always an open unit. To address this specific issue while allowing for a reduction in otherwise unnecessary preprocedure testing in patients who were low risk for adverse postprocedure

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outcomes in the event of unrecognized severe acute respiratory syndrome coronavirus virus 2 (SARS-CoV-2) infection, we implemented the ventilated headboard developed by the Centers for Disease Control (CDC) and National Institute for Occupational Safety and Health (NIOSH).[2]

Tufts Medical Center (TMC) is a 415-bed hospital in Boston, Massachusetts. From April 1, 2020, to July 1, 2021, preprocedural SARS-CoV-2 nasopharyngeal real-time reverse-transcription polymerase chain reaction (rRT-PCR) testing was performed within 72 hours of scheduled surgery for all patients expected to undergo a procedure utilizing general anesthesia or conscious sedation. The protocol was then changed given the widespread availability of PPE and the efficacy of vaccinations at preventing severe coronavirus disease 2019 (COVID-19), limiting preprocedural testing to patients undergoing a procedure utilizing general anesthesia who were either not fully vaccinated or were severely immunocompromised.

Hospital protocol dictated that aerosol-generating procedures (AGPs, which according to our state public health guidance included intubation, nebulizers, or noninvasive ventilation), when required by a postoperative patient who had tested negative or who had not been tested, could be performed either (1) in an operating room, (2) in the single negative-pressure isolation room in our PACU, or (3) in the main PACU while utilizing a ventilated headboard. The numbers and proportions of patients cared for using each approach were not tracked, which limited our analysis. Ventilated headboards were constructed at TMC utilizing specifications provided by NIOSH (Fig. 1).[2,3] Ventilated headboards were utilized ~2–3 times per week.

COVID-19 cases with symptom onset (or if asymptomatic, positive test) on or after day 8 of a hospital admission are investigated by infection prevention specialists as potential nosocomial infections. Cases are classified as nonnosocomial, possibly or probably nosocomial, or definitively nosocomial.

From April 1, 2020, to March 31, 2022, there were 95 positive tests among 10,888 preprocedural tests performed, corresponding to an overall test positivity of 0.87%. This rate increased to 7.9% (14 of 177) during the SARS-CoV-2 omicron variant era beginning December 1, 2022. During this same 2-year period, 30 cases of potential nosocomial COVID-19 were investigated, of which 15 were classified as possibly/probably or should be definitively nosocomial infections. No cases were traced to PACU exposure. Although potential PACU-acquired infections occurring in outpatients would not have been picked up by our surveillance systems, which is another limitation of this ecologic study, no such cases were brought to the attention of the infection prevention specialists.

Fig. 1. Ventilated headboard device utilized at Tufts Medical Center (TMC), designed utilizing NIOSH specifications and utilized in the postanesthesia care unit (PACU).

These findings highlight 2 important points: (1) preprocedural SARs-CoV-2 test positivity is low and (2) nosocomial SARS-CoV-2 cases traceable to exposures in the PACU are rare. This success should be considered as hospitals re-evaluate preprocedural testing protocols[4] considering adequate PPE supplies for healthcare workers as well as effective vaccinations, which protect patients against the adverse consequences of undergoing a procedure while having unrecognized SARS-CoV-2 infection.

The goal of hospital infection prevention measures is to protect both patients and healthcare workers, including the potential for transmission during AGPs,[5] especially in space-limited units such as the PACU. To mitigate this risk, novel infection prevention strategies, including the use of HEPA filters[6] and plastic head covers,[7] have been implemented worldwide. Designed for use in field hospitals in the event of a respiratory pathogen pandemic, the ventilated headboard is another strategy, and utilizes a canopy type structure to direct aerosols to an attached HEPA filter aerosol containment and air scrubbing unit.[2] The ventilated headboard provides near-instant capture of patient generated aerosol and thus increases surge isolation capacity.[3] This infection prevention strategy has also been demonstrated to be effective in real-world settings such as ours, and one study reported that ventilated headboards eliminated all evidence of the SARS-CoV-2 virus spreading to the environment.[8]

Without an experimental control, we cannot know whether the use of the ventilated headboard contributed to the low rate of transmission seen, but, as with many preventative interventions carried out in the absence of data over the course of the pandemic, this intervention provided reassurance to those working in the PACU setting that precautions were being taken. As COVID-19 prevention strategies evolve, it will be critical to continue to balance safety against the potential for delayed and deferred care, which have negatively affected public health throughout the pandemic. It is now time to practice harm reduction by limiting testing to facilitate expedient procedures for patients who need them.

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References

1. Hanson KE, Altayar O, Caliendo AM, *et al.* The Infectious Diseases Society of America guidelines on the diagnosis of coronavirus disease 2019 (COVID-19): antigen testing. *Clin Infect Dis* 2021. doi: 10.1093/cid/ciab557.
2. National Institute for Occupational Safety and Health (NIOSH). Ventilated headboards: engineering control to reduce airborne, droplet and contact

exposures during epidemic/pandemic response. Centers for Disease Control and Prevention website. https://www.cdc.gov/niosh/topics/healthcare/engcontrolsolutions/ventilated-headboard.html. Published 2020. Accessed January 2022.
3. National Institute for Occupational Safety and Health (NIOSH). Expedient Isolation Headboard Construction Using 8020 Kit. Centers for Disease Control and Prevention website. https://www.cdc.gov/niosh/topics/healthcare/engcontrolsolutions/pdf/Expedient-Isolation-Extruded-Aluminum-Assembly-Instructions_NIOSH.pdf. Published 2020. Accessed January 2022.
4. Penney JA, Doron SI. Finding the off-ramp: rethinking severe acute respiratory coronavirus virus 2 (SARS-CoV-2) preoperative screening. *Infect Control Hosp Epidemiol* 2022;43:918–919.
5. Cheng VC, Wong SC, Chan VW, *et al.* Air and environmental sampling for SARS-CoV-2 around hospitalized patients with coronavirus disease 2019 (COVID-19). *Infect Control Hosp Epidemiol* 2020;41:1258–1265.
6. Liu DT, Phillips KM, Speth MM, Besser G, Mueller CA, Sedaghat AR. Portable HEPA purifiers to eliminate airborne SARS-CoV-2: a systematic review. *Otolaryngol Head Neck Surg* 2022;166:615–622.
7. Yuan YJ, Tseng YC, Hsu CP, Feng CC, Lin CS, Lin YT. Use of plastic bag to reduce risks in operators during endotracheal intubation of patients with coronavirus disease 2019. *J Acute Med* 2021;11:99–101.
8. Landry SA, Barr JJ, MacDonald MI, *et al.* Viable virus aerosol propagation by positive airway pressure circuit leak and mitigation with a ventilated patient hood. *Eur Respir J* 2021;57:2003666.

Reproducibility of cycle threshold values from severe acute respiratory coronavirus virus 2 (SARS-CoV-2) reverse-transcription polymerase chain reaction (RT-PCR) assays

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To the Editor—To diagnose severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection, nucleic acid amplification is frequently used. Many such assays yield not only a detected or not detected result but also a cycle threshold (Ct) value. The Ct represents the cycle number needed to cross the positive (detected) signal threshold. This value is sometimes considered a surrogate for viral load because, in general, a lower Ct value suggests a higher viral concentration (and vice versa) in the specimen.[1]

Several proposals have been made for using Ct cutoffs to help determine the need for patient isolation.[2,3] However, before a test value can be used for clinical purposes, it must be determined to be reproducible; that is, similar results would be obtained regardless of the collector or across clinically insignificant time points. We sought to determine the reproducibility of Ct values to assess for discrepancy rates between sample collection variables and molecular assay performed.

The study was approved by the institutional review board (#infoEd record no. 2002107). We included patients aged >18 years who were inpatients at Creighton University Medical Center–Bergan Mercy (CUMC-BM) in Omaha, Nebraska, with a diagnosis of COVID-19 and a first positive PCR or antigen test for SARS-CoV-2 ≤5 days from the date of sampling. In total, 10 patients agreed to participate, and each underwent 4 nasal swabs. The first swab was performed by researcher A in the right naris (patient A0), and the second swab was performed by researcher B in the left naris (patient B0). After 10 minutes, 2 additional swabs were obtained: researcher A from the left naris (patient A10) and researcher B from the right naris (patient B10). The swabs were then stored at −80°C until all study swabs were collected.

Once collection was complete, swabs were processed at the CUMC-BM molecular laboratory. Samples were run on both the Abbott m2000 System (Abbott RealTime SARS-CoV-2 assay, dual target RdRp and N genes, Abbott Laboratories, Chicago, IL) and the LIASION MDX System (DiaSorin Molecular Simplexa COVID-19 Direct assay, dual target ORF1ab and S genes, Cypress, CA). The Ct values were recorded for each assay, with nondetectable values set to 40 cycles.

To account for the right censoring of Ct values at 40 cycles, we used a mixed-effects Tobit model that included a random intercept to account for the correlation due to repeated measurement of the same patient as well as fixed effects for the researcher collecting the specimen (A vs B), naris sampled (left vs right), time (0 vs 10), and assay (Abbott m2000 vs Simplexa S vs Simplexa ORF1ab). We used a top–down modeling approach that evaluated fixed interaction effects between researcher, naris sampled, time, and assay, and systematically removed nonstatistically significant interaction effects to arrive at the final model. All analyses were conducted using SAS version 9.4 software (SAS Institute, Cary, NC) with 2-tailed $P < .05$ indicating statistical significance.

The patient-specific Ct values are reported in Table 1. No statistically significant mean differences in Ct values were indicated between researchers A and B (22.9 vs 22.0; $P = .055$), left and right naris (22.2 vs 22.7, $P = .346$), or time 0 and time 10 (22.3 vs 22.7; $P = .429$). Although there was no overall mean difference between the 2 gene targets for the DiaSorin Molecular Simplexa S and ORF1ab assays (25.3 vs 25.8; $P = .457$), significant differences were observed between both DiaSorin Molecular Simplexa targets (S and ORF1ab; 25.3 vs 16.3; $P < .001$) and the Abbott RealTime SARS-CoV-2 assay (25.8 vs 16.3; $P < .001$).

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