

Drive-through point-of-care INR testing: Novel concepts for delivery of care during the COVID-19 pandemic

The coronavirus disease 2019 (COVID-19) pandemic has had an immediate impact on the healthcare system in the United States. As a subcategorical issue of the COVID-19 crisis, specialty medicine practices are grappling with how to safely manage and care for their respective patient populations. The Centralized Anticoagulation Clinic (CACC) at Dartmouth-Hitchcock Medical Center (DHMC) serves a medically vulnerable rural population who continue to require critical anticoagulation management despite the pandemic. DHMC serves the smallest population base for an academic medical center in the country, serving 170,000 patients in a 30-mile radius in Vermont and New Hampshire while often drawing patients from much farther away.¹ The CACC serves approximately 700 patients across multiple medical specialties. The services provided by the CACC include a combination of point-of-care testing (POCT) in clinic and telephonic management. These clinical operations were deeply challenged because of the COVID-19 pandemic.

During the early stages of the COVID-19 pandemic, each state independently instituted stay-at-home and quarantine orders. On March 16, 2020, New Hampshire issued a recommendation for hospitals to postpone elective procedures. The states of Vermont and New Hampshire issued stay-at-home orders starting March 24, 2020, and March 28, 2020, respectively.^{2,3} Following issuance of the stay-at-home orders, the DHMC CACC team noted the start of a decline in patient international normalized ratio (INR) testing during the COVID-19 outbreak. This decline in testing was directly related to local, state, and federal stay-at-home guidelines and patients' risk assessment and fear of exposure to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

The CACC team created a workgroup to address these concerns and develop an action plan to maintain safe, high-quality INR testing and anticoagulation management for this rural northern New England population. The key outcome from this workgroup was a successful drive-through POCT service in which the clinic was able to maintain stability in patient volumes and INR times in the therapeutic range.

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Evolving pandemic response. As the COVID-19 pandemic continued to grow in case volumes, isolation and quarantine guidelines were constantly evolving.⁴ In an effort to prevent virus transmission to this high-risk population, patients were urged to limit their exposure risks within the community. Anecdotally, clinic staff observed that many patients interpreted these guidelines to also limit their medical care. A decline in the number of encounters was observed at the end of March 2020, which did not impact overall volume for the month. With this decline in perceived daily volume and the announcement of the New Hampshire stay-at home order, the drive-through service was planned and opened 5 days following issuance of the order.

Irrespective of the perceived or real threat of COVID-19, many patients receiving anticoagulation therapy informed CACC staff that they would not be testing during the COVID-19 pandemic. However, patients on warfarin require routine monitoring even with state shutdown orders. CACC staff monitored INR testing through patient reminder calls. Clinical staff manually conducted overdue testing calls. In dialogue between patients and clinical staff regarding testing frequency, staff aimed for a delicate balance between the urgency of INR testing and the patient's risk tolerance during the stay-at-home order. Our clinical staff customized their recommendations to each patient's individual circumstance. The script initially stressed the importance of INR monitoring for safety and encouraged all patients to maintain their scheduled INR testing, especially if they were previously out of the therapeutic range. On the basis of patient feedback, this initial script was found to generally imply that INR testing was more important than minimizing SARS-CoV-2 exposure. Because of patients' fears of COVID-19, the script for these calls was revised, and the modified script stated that patients should test only when they could safely minimize COVID-19 exposure. An unintended consequence of this change may have been a reduction in the perceived gravity of the need for testing, serving as a catalyst for further reductions in INR testing.

In addition to the drive-through POCT service, the DHMC CACC adopted evidence-based guidelines and protocols enabling extended testing intervals for patients who were considered clinically stable for a designated period of time.^{5,6} The CACC put these guidelines into practice, decreasing the frequency of testing for patients who qualified and preventing further potential exposure. Patients who were compliant with INR testing with an INR measure at goal and had no changes in their warfarin dose for 4 to 6 months could increase their testing interval to every 8 or 12 weeks. For patients who were com-

pliant with INR testing with an INR measure at goal and who had had no dose change for 2 to 3 months, INR testing intervals were extended in a graduated plan to every 6 to 8 weeks if the patients remained in range with no dose adjustments. Although these extensions are best practice from a safety standpoint, this may have also affected testing volumes.

Drive-through point-of-care clinic. As the pandemic surged, the CACC team at Dartmouth-Hitchcock attended webinars and reviewed guidance from the Anticoagulation Forum in the form of webinars and interim clinical guidelines.⁵⁻⁸ This guidance afforded a contextual framework for INR POCT opportunities during the early stages of the pandemic. Leveraging this information, CACC staff worked with leadership to create a drive-through POCT service at the Heater Road primary care location. The CACC is geographically located on the Dartmouth-Hitchcock Heater Road campus and services all DHMC patients in the Lebanon, NH, area. This satellite campus served as a hub for community care during COVID-19 operations. The site maintained strict screening practices, making it ideal for routine testing in a medically vulnerable population. The team engineered a model for a stand-alone drive-through POCT station for INR checks. This drive-through POCT site allowed for increased POCT testing volumes while maintaining overall clinic volumes with minimal patient and staff exposure. Patients stayed inside their vehicles and were assisted by staff wearing personal protective equipment (PPE).

Design and implementation. The pilot drive-through service used CoaguChek (Roche Diagnostics) POCT monitors and a simplistic medical supply cart containing essential clinical items (Figure 1). The drive-through testing was provided by appointment only from early April to mid-May 2020, for approximately 6 weeks. To ensure both patient and staff safety, all patients were prescreened by telephone 24 hours before their appointment for signs and symptoms of COVID-19 or suspected exposure. Those with positive findings in the previsit screening were not permitted to attend their visit, in accordance with local infection control and occupational health guidance. All clinical staff were screened daily upon entering the building. These screenings included temperature checks, symptom-based questions, and assessment of exposure risk. PPE requirements for the drive-through testing included a face mask and shield as well as gloves in compliance with DHMC infection prevention guidelines. Single-use disposable gloves were used and hand hygiene was performed using hand sanitizer between patients. Approved disinfectants were also used between patients to clean the monitors, cart, and face shields to further reduce the potential for infectious transmission.

The front entrance of the Heater Road campus building was the designated testing location, where a large awning served as modest protection from inclement weather. Patients remained in their vehicles, and the clinician performed

Figure 1. Initial version of the medical supply cart.



INR POCT curbside at the vehicle's window. Patients were given their INR result in real time, and results were manually entered into the electronic medical record shortly after the drive-through service. Patients received a call later the same day to review their warfarin management plan. Slots for drive-through testing were offered in 5-minute increments for up to 15 patients per day, 4 days a week. Patients were scheduled consecutively in one block of time. Once the process was tested, an alternate clinician was trained on the workflow to allow continuity in the event of the absence of a primary clinician.

Before the pandemic, the CACC managed 90% of their patient population via telephone and the remaining 10% were seen in the clinic for POCT. Patients managed by telephone determine their INR via home monitors, testing at external laboratories, or visiting nurse services. Patients became less willing to attend a face-to-face clinic visit or in-person laboratory visit. The drive-through POCT service allowed testing for any patient managed by the CACC, regardless of prior testing modality. For the 6 weeks of operation of the drive-through POCT service, the CACC did not offer in-person office visits.

Barriers and challenges. The CoaguChek monitors have a designated operating temperature range of 59 to 90 °F.⁹ The

average outdoor temperatures in northern New Hampshire in April were often below 40 °F. This required attentive planning and rotation of 3 monitors from indoors to prevent temperature errors. Each monitor was used outdoors for no more than 3 to 5 minutes to limit temperature errors. If the CoaguChek monitor displayed an error due to low temperature, the INR POCT was repeated with a new device from indoors.

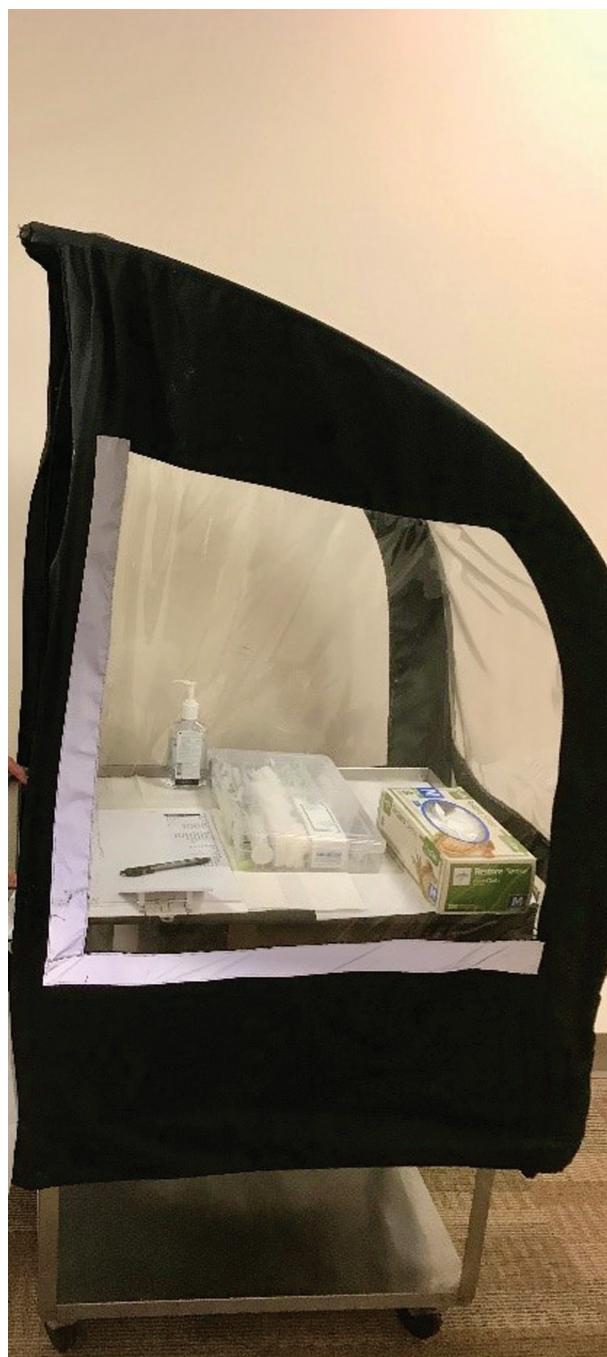
Inclement weather also included wind and various forms of precipitation. Additional improvements were made to the cart to enhance the protection of equipment and improve clinic efficiency, including the improvisation of a snow blower cover to provide protection from the elements (wind, rain, and snow) for the cart's medical equipment and supplies (Figure 2). Other modifications included adding weights to stabilize the cart when it was parked in an open lot during periods with higher wind speeds. These modifications improved turnaround time between patients, reduced CoaguChek errors due to temperature variance, and protected the documentation and printed schedule. The revised cart ensured a more efficient and safe operation for both staff and patients. The main challenge with the PPE requirement was severely decreased visibility due to fogging of the face shield, which impacted the staff's ability to see the screen of the CoaguChek monitor and collect the POCT sample.

After careful review with the lead nurse clinician and key members of the life safety team, the location of the drive-through service was moved to prevent obstruction of building egress in the event that emergency service vehicles needed to access the main entrance. The drive-through service was relocated to the rear staff parking lot at the facility. The new site required directional signage at the facility entrance for patient wayfinding. This site did not have a structural overhang for vehicles and staff and, as a result, was more exposed to the weather. The impact of weather exposure was minimized by using the cart cover, and inclement weather did not prohibit the drive-through service from being run outdoors.

Outcomes. The drive-through POCT service operated for approximately 6 weeks in the early phase of the pandemic, from April 1, 2020, to May 15, 2020. The drive-through clinic operation ended when elective medical appointments reopened for DHMC. No cases of COVID-19 from this patient panel were reported to CACC staff, and no staff tested positive for COVID-19 during this operation.

In March 2020, the CACC performed 1,338 anticoagulation management encounters, including in-clinic and telephonic visits. With the availability of the drive-through POCT service, the CACC maintained stability in patient care, completing 1,367 encounters. Even though in-person POCT appointments became available in May 2020, the overall monthly testing volume decreased to 1,196 encounters. Despite screening practices to ensure patient safety and encouragement from CACC staff to maintain compliance with INR testing,

Figure 2. Improved medical supply cart with additional protection from the elements.



patients were hesitant to return to healthcare facilities for POCT and laboratory testing. A subset of patients continued to avoid all INR testing. By June 2020, patient encounters rebounded to 1,358 encounters, matching prepandemic levels, as patients became more comfortable with engaging in medical care in person. In total, the CACC completed 168 drive-through patient appointments in April 2020 and 84 appointments in May 2020.

Before the pandemic, the CACC maintained an INR time in therapeutic range (TTR) of 68% to 70%. In February and March 2020, TTR was 70% and 72%, respectively. In April, the CACC maintained a stable TTR of 70%. In May 2020, the TTR decreased slightly to 68% and rebounded in June 2020 to 71%. The drive-through POCT service promoted patient engagement and achieved maintenance of TTR above the benchmark for anticoagulation management.¹⁰

Discussion and conclusion. The Dartmouth-Hitchcock CACC drive-through POCT service provided critical anticoagulation monitoring and minimized person-to-person contact during the early phase of the COVID-19 pandemic. This novel approach to patient care highlights fundamental needs for this high-risk patient population: ease of access, flexible patient scheduling, infection prevention, and durable equipment management. Ambulatory clinics may replicate this template in the future to maintain safe operations should the need arise again. As an example of the adaptability of the drive-through POCT clinic, primary care services at the Dartmouth-Hitchcock Heater Road campus adopted and implemented this model to establish a drive-through POCT service for glycosylated hemoglobin.

The drive-through POCT service is a testament to the ingenuity, will, and determination of the team to provide continuity of anticoagulation care during a global pandemic. Anticoagulation clinics across the country must continue to provide essential testing services to meet clinical needs for this high-risk patient population. The Dartmouth-Hitchcock CACC team have developed and demonstrated a highly functional, accessible, and scalable template to meet this specialty's need during a time of pandemic.

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Bradley Peduzzi, MSN, RN

Department of Pharmacy
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA

Marilyn Gaske Hill, PharmD, MHA

Department of Pharmacy
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA

Janet Hamilton, LPN

Department of Pharmacy
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA

Courtney Parker, PharmD

Department of Pharmacy
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA

Sukriti Raut, BS

Analytics Institute—Value Reporting & Analytics
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA

Joseph Berndsen, PharmD

Department of Pharmacy
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA

Courtney Farrell, MD

Department of General Internal Medicine
Dartmouth-Hitchcock Medical Center
Lebanon, NH, USA
courtney.r.farrell@hitchcock.org

Acknowledgments: Sarah Sabalewski is acknowledged for providing operational support for the CACC drive-through POCT service.

Disclosures: The authors have declared no potential conflicts of interest.

Keywords: anticoagulants, COVID-19, delivery of healthcare, drive-through, international normalized ratio, point-of-care testing

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<https://doi.org/10.1093/ajhp/zxab332>