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Original Article

Assessing current capabilities and barriers to performing routine laboratory tests on patients with suspected high consequence infectious disease at frontline acute care hospitals

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Abstract

Introduction: Patients with a suspected high-consequence infectious disease (HCID), such as Ebola virus disease, may require routine laboratory testing to guide management. We assessed the capabilities of frontline hospitals and the barriers they face performing laboratory testing for patients with a suspected HCID.

Methods: A one-time confidential REDCap survey querying capabilities to safely perform laboratory tests that the Centers for Disease Control and Prevention considers critical for patients with a suspected HCID was sent to 95 institutions in Baltimore, MD, Boston, MA, New York City, NY, and Washington, DC, from January to May 2025.

Results: Fifty (53%) institutions responded, mostly teaching hospitals (96%), with 24% reporting prior experience evaluating a patient with suspected Ebola virus disease. While many hospitals could perform on-site blood gas (70%), hemoglobin/hematocrit (68%), and lactate (68%) tests on a suspected HCID patient, fewer could safely perform a chemistry panel (64%), a urinalysis (60%), a complete blood count with differential (56%), and a malaria rapid diagnostic test (RDT) (48%) on a suspected HCID patient. The five tests respondents most often considered extremely or very important were hemoglobin/hematocrit (91%), chemistry panel (90%), CBC with differential and platelet count (89%), malaria RDT (88%), and blood gas (88%). Reported barriers to performing routine laboratory testing included issues related to patient and staff safety, infection control, lack of appropriate space, and funding.

Conclusions: Our survey identified several barriers to implementing safe laboratory testing. The inability to conduct these laboratory tests may result in delays in care when an HCID is suspected.

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Introduction

High-consequence infectious diseases (HCIDs) are easily transmitted between people, have limited or no medical countermeasures, and can cause high morbidity and mortality.[1] Given the associated risks, managing suspected or confirmed HCIDs requires rapid recognition and implementation of infection control practices and timely communication with public health authorities. While no universally agreed upon list exists, examples of HCIDs include respiratory infections such as Nipah virus infection and viral hemorrhagic fevers (VHF) such as Ebola Virus Disease (EVD), Marburg Virus Disease (MVD), and Lassa fever. Some HCIDs, particularly VHFs, generate Category A infectious substances that can cause permanent disability and life-threatening or fatal disease in humans or animals when exposure occurs.[2,3] Therefore, enhanced laboratory safety practices are needed when handling patient specimens.

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The increasing frequency of recognized VHF outbreaks globally highlights the need to ensure that all US hospitals are prepared to identify, isolate, and provide initial stabilizing care for a suspected HCID patient.[4] In 2024, Rwanda experienced its largest MVD outbreak to date. In 2025, there have been outbreaks of MVD in Tanzania and Ethiopia, Ebola Sudan virus in Uganda, Lassa fever in Nigeria, Crimean–Congo hemorrhagic fever in Iraq, and Nipah virus in India.[5–11] The 2024 fatal case of Lassa fever that presented to Iowa, U.S., further reinforced that HCIDs can present anywhere in the United States.[12]

While other studies have described healthcare facility readiness to provide critical care for HCID patients in the US,[13,14] we are not aware of any studies assessing readiness to perform routine laboratory testing on a suspected HCID patient. Laboratory testing is an important aspect of the initial care of a patient with an HCID, given that it allows providers to a) confirm or rule out the HCID diagnosis, b) assess for other non-HCID conditions that could be alternate diagnoses or co-infections, and c) assess for life-threatening electrolyte derangements or cytopenias that require prompt correction.[15]

The ability to safely perform laboratory testing for suspected HCID patients remains a challenge, even in resource-rich countries such as the United States. Since HCIDs are relatively rare events, it can be hard to justify the resources needed to provide appropriate equipment, space, protocols, and ongoing training to safely perform laboratory testing on specimens that may contain category A infectious substances. However, while confirmed HCIDs are rare in the US, it is not uncommon for symptomatic patients to meet criteria for a suspected HCID based on travel or exposure history. These patients will need to be treated with the same infection prevention and control measures as a confirmed HCID case until the diagnosis is ruled out. Failure to perform appropriate laboratory testing and to respond clinically to results for patients initially suspected of having an HCID poses significant risks. Such lapses may result in delayed or missed diagnoses of alternative conditions, suboptimal clinical management, and adverse patient outcomes.

It is unknown how many laboratories in the United States can safely perform routine laboratory testing for HCID patients. Amongst acute care hospitals at four major US urban centers, we aimed to a) assess their ability to perform 18 routine laboratory tests on site for patients with suspected or confirmed HCIDs and b) identify barriers they face in performing routine laboratory testing for these patients.

Methods

We conducted a confidential, cross-sectional online survey through REDCap from January to May 2025. Points of contact for all acute care hospitals with emergency departments in the metropolitan areas of New York City, Boston, Baltimore, and Washington, D.C. were identified in collaboration with the Greater New York Hospital Association (GNYHA), the Conference of Boston Teaching Hospitals (COBTH), Johns Hopkins Hospital, and the District of Columbia Hospital Association (DCHA), respectively. These cities were selected for inclusion based on their status as major international travel hubs with an elevated risk of receiving travelers with suspected or confirmed HCIDs. Each collaborator distributed the study recruitment email containing a link to the confidential REDCap survey to all acute care hospitals with emergency departments in their city, with two follow-up recruitment emails. Survey instructions recommended that leaders from the Clinical Laboratory, Emergency Department, and Emergency Management collaborate to submit a single response per institution.

Data collected in the survey included facility characteristics and the HCID-related capabilities available at each facility. The survey also asked whether hospitals had encountered patients suspected or confirmed to be infected with an HCID within the past 10 years; their capabilities to safely perform 18 laboratory tests on these patients; the perceived importance of those tests for the clinical care of a patient with a suspected or confirmed HCID; and barriers to implementing testing for HCID patients. Laboratory tests included in this survey were based on what the U.S. Centers for Disease Control and Prevention (CDC) considers necessary for patients with a suspected HCID.[16] Response options for each laboratory test included "Point of Care (POC) Testing," "Onsite Core Lab Testing," "Off-Site Testing," and "Cannot Currently Perform." POC testing and onsite core lab testing were combined to better compare onsite testing to offsite testing with the latter resulting in longer result turnaround times, and likely impacting patient care. The importance of each laboratory test was graded using a Likert Scale with four categories: "Extremely Important," "Very Important," "Slightly Important," and "Not Important," plus a "Not Sure" response option. Participants were asked to assess barriers affecting the ability to safely perform these laboratory tests as one of three categories: "Significant barrier," "Somewhat of a barrier," or "Not a barrier," with an "Unsure whether this is a barrier" response option. The full survey instrument is available in the Appendix 1.

The study team performed a quality review of the final data set. Disparate responses were clarified between a given hospital's survey respondents to arrive at a single response for each hospital. The study team also followed up with individual facility laboratory directors from all respondent hospitals via email to confirm their facility's responses were accurate. Results were summarized in descriptive statistics of counts and percentages.

This study was reviewed by the NYU Institutional Review Board (IRB) and was determined not to be human subject research.

Results

Demographic and clinical characteristics

Fifty (53%) institutions responded, mostly from New York City (66%, Table 1). Most institutions were teaching hospitals (n = 48, 96%). Thirty (60%) were general hospitals with adult and pediatric services, 18 (36%) had more than 500 beds, and 27 (54%) were tertiary or quaternary care centers.

Existing HCID capabilities

Twelve (24%) had prior experience evaluating a patient with suspected EVD. Thirty-nine (78%) institutions can safely collect, package, and ship Category A laboratory specimens, and forty-one (82%) have a protocol for handling and disposing of Category A waste.

Laboratory capabilities for the institutions are summarized in Figure 1. Most institutions could perform on-site respiratory testing (84% for COVID-19, 78% for influenza, 72% for RSV) and pregnancy testing (84%) on a suspected or confirmed HCID patient. A majority could also perform blood gas (70%), hemoglobin/hematocrit (68%), lactate (68%), and a chemistry panel (64%). Fewer were able to perform coagulation tests (60%), a liver function panel (56%), and a CBC with differential and platelet count (56%). Fewer than half could perform a malaria rapid diagnostic test (RDT) (48%) or blood smear (42%). For blood cultures, while 68% of institutions

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Table 1. Characteristics of respondent hospitals

Characteristic	n (%)
US Department of Health and Human Services (HHS) Region	
1: Boston, MA (Region 1)	9 (18)
2: New York City, NY (Region 2)	33 (66)
3: Washington, DC and Baltimore, MD (Region 3)	8 (16)
Hospital type	
General hospital with adult and pediatric services	30 (60)
General adult hospital without pediatric services	16 (30)
General pediatric hospital	3 (6)
Specialized hospital (e.g. solely orthopedic, oncologic, psychiatry, etc.)	1 (2)
Staffed Beds Range	
0–249	16 (32)
250–499	16 (32)
500–749	8 (16)
750+	10 (20)
Teaching hospital	48 (96)
Level of care provided	
Tertiary/quaternary medical center	27 (54)
Not for profit community hospital	22 (44)
Other	1 (2)
Experience with evaluating a suspected HCID patient	
Ebola disease	12 (24)
Marburg virus disease	2 (4)
Lassa fever	3 (6)
Nipah virus infection	1 (2)
Management of Category A infectious substances	
Can safely collect, package and send out lab specimens	39 (78)
Has a protocol for handling and disposing waste	41 (82)

Note: This table describes the characteristics of hospitals that responded to the survey. Abbreviations: DC—District of Columbia, HCID—High consequence infectious disease, MA—Massachusetts, MD—Maryland, NY—New York.

reported being able to perform them, only 34% could do so onsite. Ungrouped results for POC testing and onsite core lab testing capabilities can be found in Appendix 2.

Perceived importance of laboratory testing for evaluation of HCID patients

The six tests most often considered extremely or very important were hemoglobin/hematocrit (91%), chemistry panel (90%), CBC with differential and platelet count (89%), malaria RDT (88%), blood gas (88%), and lactate (88%) (Figure 2). The five tests most often considered slightly or not important were magnesium (59%), urinalysis (53%), RSV testing (53%), influenza testing with typing (51%), and troponin (43%).

Perceived barriers to laboratory testing for evaluation of HCID patients

Factors most commonly considered significant barriers included insufficient staff training (36%), lack of appropriate equipment (31%), concern that processing HCID equipment samples may void the equipment's warranty (31%), lack of guidance on how to safely perform these tests (31%), concerns that processing HCID samples may impede the ability to perform testing on other patients (29%), and infection control safety risks (28%) (Figure 3).

Discussion

Our study describes gaps in the ability to safely perform routine laboratory testing for a patient with a suspected or confirmed HCID, and outlines several challenges experienced by hospitals in providing these capabilities. Notably, only 64% of respondents were able to perform a chemistry panel, and 48% were able to perform a malaria RDT either on site in the hospital's laboratory or through POC testing platforms. Both tests were among the 6 tests considered most important for the care of a clinically unstable patient, per the survey respondents. Additionally, while 83% of respondents indicated blood cultures to be extremely or very important clinical tests, only 34% of sites could perform a blood culture onsite, and another 34% could send them for offsite testing. The issues related to implementing safe laboratory testing that most respondents considered "significant" included insufficient staff training, lack of appropriate equipment, lack of guidance on how to safely perform these tests, and concerns about voiding the equipment warranty.

In order to safely handle and process clinical laboratory specimens from a patient with an HCID that is considered a category A infectious substance, laboratories need to perform a risk assessment for receiving and handling specimens, train staff in the use of appropriate personal protective equipment (PPE), ensure proper use of a biosafety cabinet (BSC), and implement appropriate disinfection protocols.[17] Many core laboratories where chemistry and hematology testing occur do not have the proper space and equipment to safely handle specimens containing HCID material.[18] Given that Ebola Virus has an infectious dose of fewer than 10 virions and blood virus concentration can exceed 10^8 virions per milliliter, aerosolizing procedures in the laboratory, such as centrifugation, can lead to significant exposure.

When evaluating a febrile returning traveler, prompt diagnosis of malaria is important as it is the most common specific etiologic diagnosis in this population.[19] Delayed diagnosis can lead to significant morbidity and mortality, especially since empiric treatment of malaria is generally not recommended. In 2018, of the seven fatal cases of malaria in the US, all had delayed diagnosis, delayed treatment, or inappropriate treatment for severe malaria.[20] Testing for malaria is also important in a patient with suspected VHF, given that malaria co-infection with EVD or Lassa fever, respectively, is common.[21,22] There are well-described cases of inadequate or delayed diagnosis of malaria due to concern that the patient could have EVD.[23]

Public health agencies have provided guidelines on safely performing routine laboratory tests in a hospital's core laboratory

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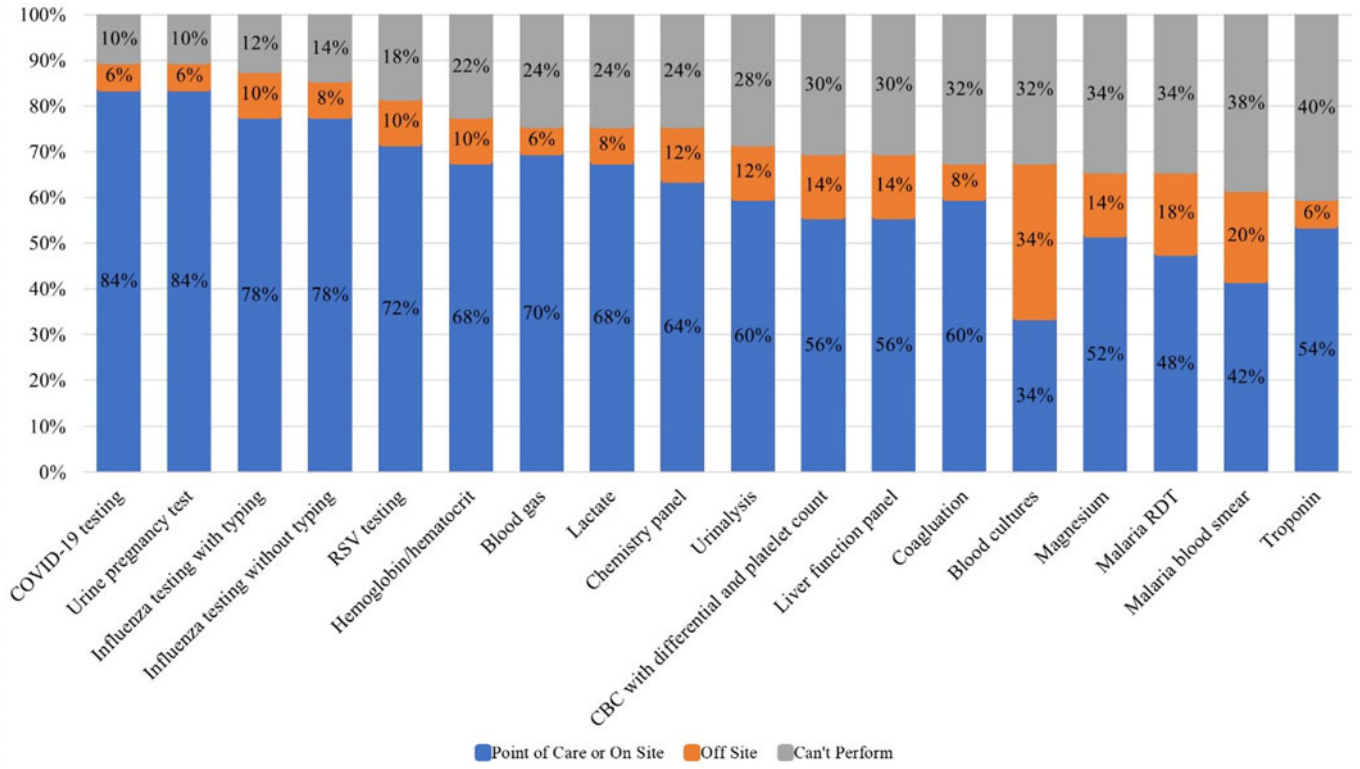

Figure 1. Which of the following best describes your institution's current ability to safely perform this test for a suspected or confirmed high consequence infectious disease (HCID) patient?. Stacked bar graph representing the ability of hospitals to safely perform 18 routine laboratory tests on a suspect HCID patient. Blue bars indicate hospitals that can perform the test at the point of care or at an on-site core laboratory. Orange bars indicate hospitals that can collect a specimen and send it to an off-site laboratory. Gray bars indicate hospitals that cannot perform the laboratory test.

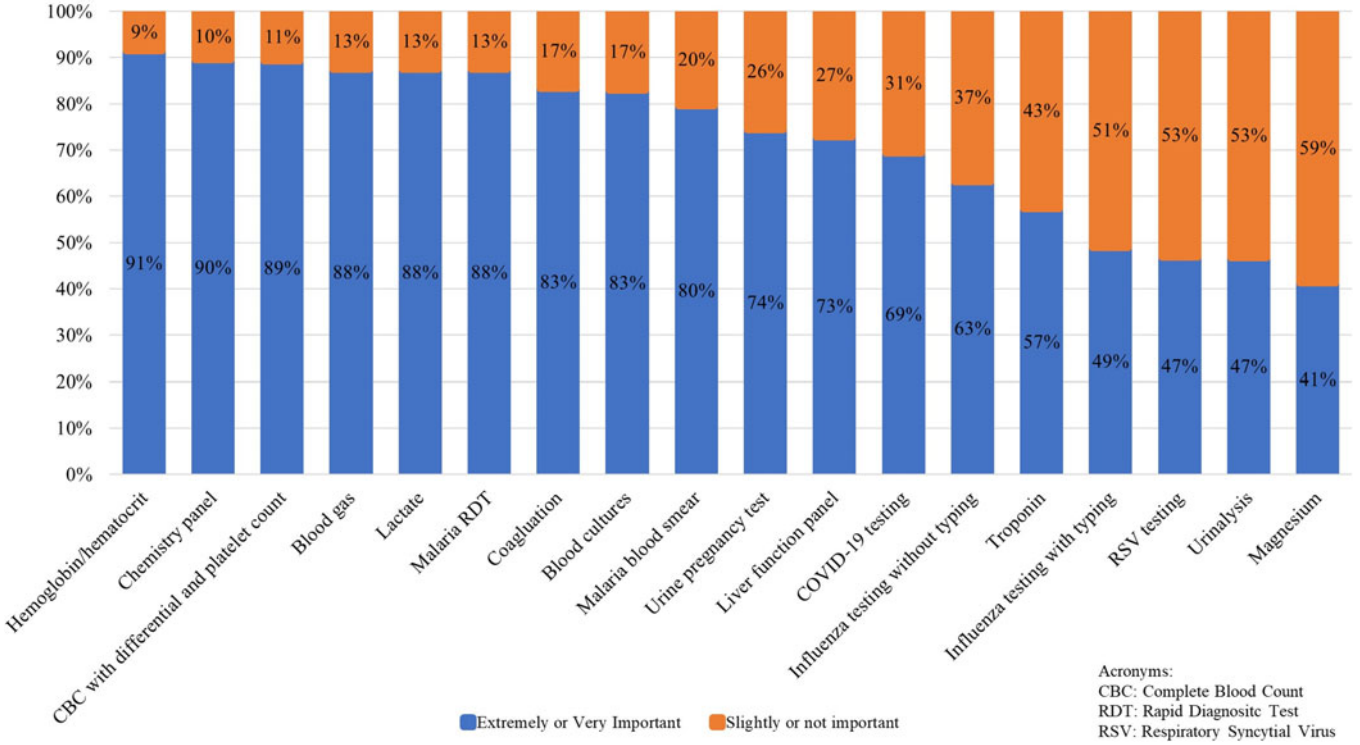

Figure 2. How important do you consider this test to be for the immediate care of a clinically unstable patient with a suspected or confirmed high consequence infectious disease (HCID) in your emergency department?. Stacked bar graph representing the perceived importance of 18 routine laboratory tests for a suspected HCID patient. Blue bars indicate respondents who perceive the lab test as "Extremely important" or "Very important." Orange bars indicate respondents who perceive the lab test as "Slightly important" or "Not important."

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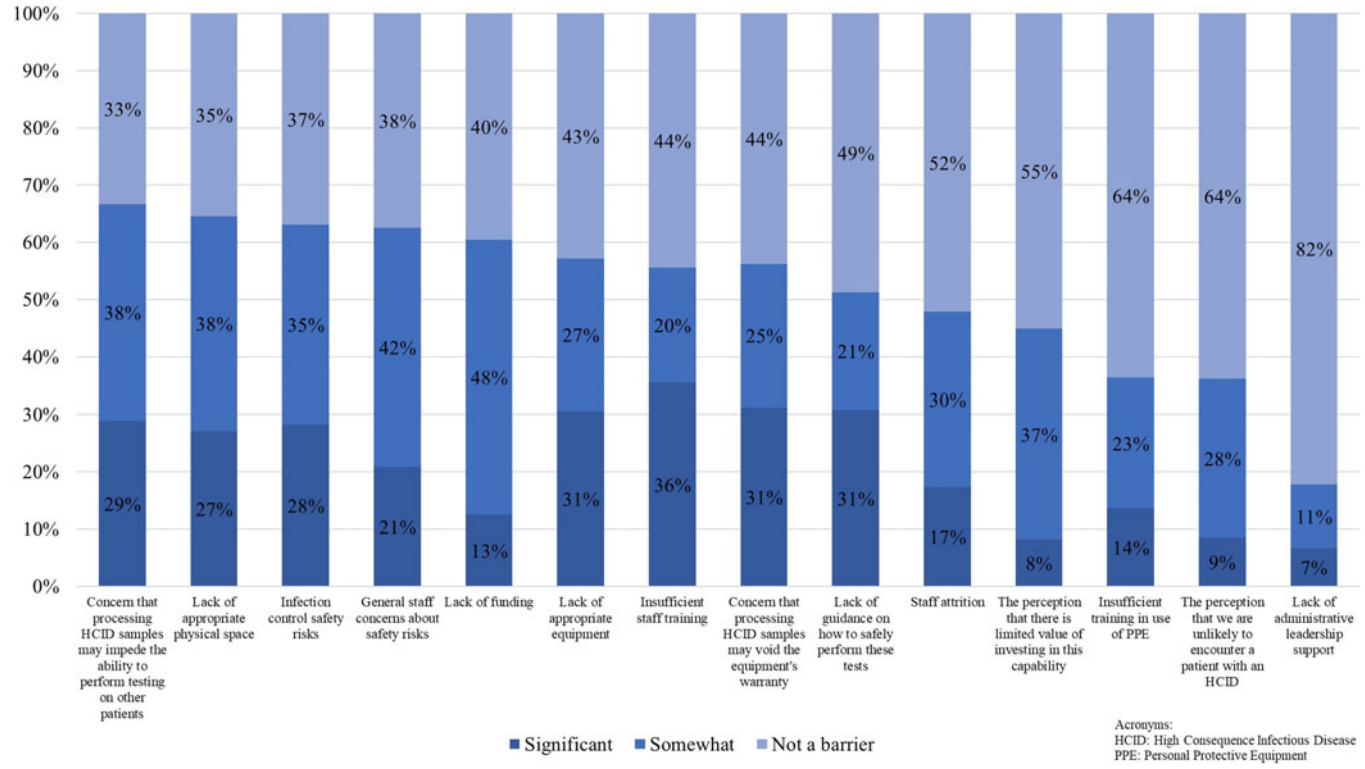

Figure 3. To what degree are any of the following barriers to implementing safe lab testing for a suspected or confirmed high consequence infectious disease (HCID) patient at your facility?. Stacked bar graph representing the degree to which 14 factors are barriers to implementing safe lab testing for a suspected HCID patient. Dark blue bars represent respondents who perceive the factor as "Significant barrier." Blue bars represent respondents who perceive the factor as "Somewhat of a barrier." Light blue bars represent respondents who perceive the factor as "Not a barrier."

facility on patients with suspected VHF or HCID.[16] An alternative is to use POC lab testing platforms. New York State and New York City Departments of Health recommend performing these tests in a separate room near the patient isolation room with a Class II BSC or splash protection shield. In all cases, there needs to be a designated area for packaging and storing category A medical waste, designated areas for donning and doffing of PPE, and appropriate space and supplies for packaging specimens to be sent for VHF testing. A recent publication describes a toolkit that provides a solution for infection prevention and control, waste management, occupational health, laboratory test collection, processing, and reporting of results for a basic metabolic panel and a malaria RDT in the context of a suspected VHF patient evaluation.[15]

Our study is subject to limitations. Our survey only included hospitals from four urban centers on the East Coast of the United States, limiting generalizability. Our data set may overestimate the routine laboratory capabilities compared to those of less well-resourced hospitals outside of large urban centers. However, we achieved a high response rate (53%), which limits response bias within our sampling frame. Survey responses may not fully reflect what happens in a real-world situation. We addressed this by attempting to confirm laboratory capability responses with the laboratory directors from all respondent hospitals to ensure accuracy. There were only three hospitals where we did not receive a direct response from a laboratory director despite our outreach. Finally, respondents may have incentives to overestimate their laboratory capabilities to avoid publicizing their gaps in preparedness. However, the confidential nature of the survey was emphasized in our survey invitations to encourage accurate responses.

All acute care hospitals in the US should be prepared to safely provide stabilizing care while the patient is in isolation for a suspected HCID, at least while awaiting triage to a special pathogen treatment center.[24] Having routine lab capabilities is essential for providing stabilizing care and is a key element of HCID preparedness.[4] This study identified gaps in the ability to perform routine laboratory tests and barriers to implementing these laboratory capabilities. While some solutions to these challenges have been proposed, future research and public health guidance should focus on how to efficiently scale up these solutions to all acute care hospital settings and provide strategies to alleviate barriers to implementation. Given the need for physical space, equipment, and training, additional financial support may be needed to enable hospitals to safely provide the minimum necessary routine laboratory testing while evaluating a patient for an HCID.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/ice.2026.10465.

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