



COMMENTARY

INCREASING INTERNATIONAL COLLABORATION AND NETWORKING AMONG HIGH-LEVEL ISOLATION UNITS AND PROGRAMS

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THE GLOBAL LANDSCAPE of high-level isolation units (HLIUs), also referred to as special pathogens units or biocontainment patient care units, has evolved over the last several decades, in response to the increasing frequency of high-consequence infectious disease (HCID) outbreaks. HLIUs are designed for clinical care and management of patients with HClDs (eg, viral hemorrhagic fevers, monkeypox, Middle East respiratory syndrome). These units are equipped with specialized physical infrastructure, engineering controls, trained staff, and advanced infection prevention and control (IPC) practices to provide safe and effective clinical care while substantially mitigating nosocomial transmission risks to healthcare workers. Increasingly, national health systems are recognizing the value of investing in such units for HCID preparedness and response, as evidenced by the establishment of additional HLIUs in the

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United States, United Kingdom, Australia, and Malta, among others, in recent years.¹⁻⁴ In parallel, national networks of HLIUs have been established to coordinate and enhance HCID outbreak preparedness and response activities among multiple institutions in a single country.^{2,5-7} In the United States, the Office of the Assistant Secretary for Preparedness and Response within the US Department of Health and Human Services funded the formation of the National Emerging Special Pathogens Training and Education Center (NETEC) to fulfill that role.⁵

NETEC is a consortium of the 3 nongovernmental US academic medical facilities that successfully treated patients with Ebola virus disease without any staff member infections in 2014: Emory University Hospital, Nebraska Medicine, and NYC Health + Hospitals/Bellevue. NETEC was established as the United States instituted a tiered system for potential Ebola cases in response to the 2014-2016 Ebola outbreak in West Africa. This tiered approach consists of frontline facilities, assessment hospitals, treatment centers, and 10 HLIUs, termed Regional Emerging Special Pathogen Treatment Centers.^{1,8}

Although NETEC has been largely focused on training and education, hospital readiness, and research coordination at the domestic level, NETEC hosted a 2018 international workshop on high-level isolation in the Washington, DC, area that convened representatives from US Regional Emerging Special Pathogen Treatment Centers and HLIUs in Europe and Asia to share expertise and experiences treating patients with HCIDs.^{9,10} This meeting represented a key step in strengthening relationships, disseminating global knowledge, and encouraging collaboration among HLIUs with experience treating patients with HCIDs. However, the meeting was a onetime event and a lack of global funding to support a formalized network diminished opportunities to continue collaborations and conversations. As the world continues to face the COVID-19 pandemic—while also responding to competing outbreaks of HCIDs, such as Ebola, Marburg virus disease, Nipah virus disease, Middle East respiratory syndrome, monkeypox, and Lassa fever—now is the time for HLIUs, national governments, and the international donor community to fund, formalize, and expand international networking and collaboration across established and developing HLIUs. This could advance and facilitate innovation in the field of high-level isolation and HCID preparedness, build partnerships, instill mechanisms for rapid information sharing during infectious disease emergencies, and demonstrate the value of HLIU programs beyond the specialist facility. In the following sections we describe 3 potential outcomes of international networking and collaboration across HLIUs.

FACILITATING INNOVATION AND SHARING BEST PRACTICES

Two separate regional efforts took place in the mid-2000s to establish guidelines for HLIU infrastructure and processes: a 2005 US consensus meeting¹¹ and a 2005-2009

European consensus effort.¹² Resulting consensus reports are the hallmark publications for the design and operations of HLIUs. They detail core components, minimum requirements, and optimal standards when constructing the physical unit and developing an HLIU program. At the time, few HLIUs had experience treating a patient with an HCID; in the years since, there have been significant advancements in the fields of high-level isolation and HCID preparedness as HLIUs have cared for patients with Ebola, monkeypox, and Lassa fever, among others, and have captured lessons learned from the international response to the COVID-19 pandemic. Although several units have published their approaches, capabilities, and procedures following care of a patient with an HCID, there lacks a formal mechanism to share and promote best practices among HLIUs. Increased collaboration of existing and developing HLIUs from all regions of the world can serve as a platform to share successful approaches and unique perspectives. HLIUs could learn from and adapt strategies and protocols based on best practice approaches used by other facilities or based on varied experiences managing various pathogens.

HLIUs face unique clinical and operational challenges due to their distinct requirements, large multidisciplinary teams, and relative infrequent use for patients with HCIDs. Increased networking across a formalized HLIU collaborative during peacetime periods between outbreaks of HCIDs would serve to build relationships among network partners and facilitate opportunities to advance the field. It could be used as a platform to identify aspects of high-level isolation in which HLIUs continue to struggle, facilitate conversation around those topics, spark innovation and research to advance those areas, and potentially result in development or updates of guidelines and recommendations that could be shared with units developing or planning to develop an HLIU. Moreover, the network could be leveraged to advance research and knowledge of HCIDs by establishing a mechanism for collaborative research in diagnostics and therapies. In these activities, as with all areas of increased international networking among HLIUs, partners in lower- and middle-income countries would have a critical role in advancing certain areas of high-level isolation by bringing forward best practices and unique solutions, such as cost-effective strategies, to units in higher-resourced countries.

The knowledge and expertise HLIUs have gained through experience over the last decade can also be used to explore other relevant topics for HCID preparedness, such as HCID transport and the role of HLIUs in bioterrorism preparedness, and to revise areas that were debated in previous consensus efforts. For example, strongly opposed positions emerged during the European consensus effort on the safest methods for management of routine clinical samples and disposal of liquid waste, as there was not enough evidence at the time to determine best practices.¹² These areas were extensively researched and discussed during and after the 2014-2016 West Africa Ebola

outbreak; the new knowledge and best practices that HLIUs implemented related to those domains can be discussed and shared widely through greater collaboration.

SERVING AS A MECHANISM TO SHARE INFORMATION DURING HEALTH EMERGENCIES

The early COVID-19 response highlighted the invaluable role of individual and institutional relationships in facilitating rapid information sharing during a public health emergency, particularly information related to best practice approaches to clinical management and IPC protocols between individual clinicians or hospitals. Such information can then be acted upon or integrated into clinical management practices well before being introduced in national or international guidance.^{13,14} The expansion of international networking among global HLIUs would serve as a platform for this type of rapid information exchange. Many HLIUs played a pivotal role in responding to the novel disease, including being some of the first facilities in their respective countries to care for patients.^{13,15-18} A small group of global HLIUs reported the value of leveraging preexisting relationships in early 2020 to rapidly exchange information that informed local IPC processes and clinical approaches to COVID-19 care.¹³ A global HLIU network, with partners in all regions of the world, offers the operational linkages between frontline, on-the-ground health facilities that can facilitate and foster rapid knowledge generation and response approaches during future HCID events.

DEMONSTRATING THE VALUE OF HLIU PROGRAMS

Many HLIUs face continued sustainability challenges in part due to the substantial ongoing financial investments needed to maintain their capacity and capabilities for operational readiness, despite HCID events being infrequent occurrences.^{12,19} As such, many units are required to routinely justify their existence or relevance to organizational leaders and external funders, especially during times when there is no perceived immediate HCID threat. However, the value and impact of HLIU programs go beyond the physical walls and the readiness of the facility: the expertise of highly trained HLIU teams and the capabilities and resources inherent to HLIU programs can be leveraged to support surge situations across entire health systems, such as the COVID-19 pandemic. Benefits highlighted by HLIUs that supported and at times accelerated their pandemic response efforts included: designated isolation units for initial patients, the ability to leverage specially trained HLIU staff to support hospital response to COVID-19, expertise to advise national governments and ministries in making evidence-based policies and guidelines, and regular provision of national webinars or consultations.^{13,15}

Moreover, there is a need for global HLIUs to learn from each other on how best to disseminate the expertise and capabilities of these specialized facilities to the broader health system before and during health emergencies to improve resilience to health emergencies. In fact, facilities that are heavily incorporated into national health plans or supported by federal funding might have a mandate to enhance regional or national preparedness for HCIDs. Increased networking of units could serve to (1) identify best practices that can be adapted to local contexts and cultures and shared with regional facilities, and (2) lead to innovations in how HLIU programs have or could serve as a central node for advancing regional or national readiness and response to HCIDs.

Beyond the value for HCID readiness and response, increased networking of HLIUs could help demonstrate the larger role HLIU programs might have in enhancing IPC practices for routine care in frontline healthcare facilities. The COVID-19 pandemic demonstrated the need to build basic IPC concepts into routine care, as HCIDs or future infectious disease threats have the potential to quickly outstrip HLIU capacities at national and international levels. Increased networking can help draw on the various experiences of HLIUs during the COVID-19 pandemic to demonstrate the value of HLIU programs beyond the physical unit and advocate for all healthcare workers at all levels of the health system to establish and maintain baseline proficiency in IPC principles.

Infectious diseases are not constrained to borders, and as Heymann et al reflect on the connectedness of the global community, “we are only as safe as the most fragile states.”²⁰ It is in the interest of our collective global health security that all countries have the capabilities and capacities to prevent, detect, and respond to HCID cases and outbreaks. To date, HLIUs have primarily been a feature limited to high-resource countries, and the tools and guidelines resulting from previous US and European Union consensus efforts may not be relevant to HLIUs outside of those regions. There is a need for contextually and culturally appropriate HLIU guidelines and recommendations to be led at the country or regional level, particularly in regions of the world that have not previously engaged with global or regional HLIU efforts. While not all countries will have the desire or ability to invest in an HLIU program, there could be an opportunity to advocate for regional HLIU leaders with highly trained personnel, vast knowledge of HCID readiness and response, and established operating procedures. These leaders could enhance regional health security and HCID preparedness and response. However, some European and US HLIUs have reported financial challenges in sustaining their physical unit and programs,^{12,19} and therefore the ability to expand this expertise to national or regional levels would require increased funding and resources.

There would also be immense benefit in leveraging this network of established HLIU experts to provide mentoring and technical assistance to units in development or units wanting to advance their capabilities. The highly trained staff inherent to HLIUs are well positioned to provide their

expertise, established standard operating procedures, and experience managing HLIU programs to facilities seeking to build an HLIU or enhance readiness capabilities. While these mentoring and technical support opportunities could be facilitated through an established global network, intentionally targeting collaborations at a regional level could ensure better adaptability and relevance of tools, expertise, and approaches and enhance connections and relationships within a region. These activities, however, would also require additional funding streams. The international donor community could support the strengthening of both regional and global health security by promoting and funding the development and advancement of HLIUs and their accompanying HCID response capabilities in all regions of the world.

To advance the field of high-level isolation and expand the value of HLIU programs beyond the physical facility to broader national or regional HCID readiness and response, it is imperative to include and promote greater representation from lower- and middle-income countries in all aspects of international HLIU collaborations. While increased conversation around high-level isolation and networking of global HLIUs could increase interest of the international donor community and buy-in from national health ministries or government stakeholders, there is a need for existing global HLIUs to demonstrate the value of investing in HLIUs as part of national or regional health security plans and to detail the expected returns and outcomes of establishing such programs, in higher-resource settings and in lower- and middle-income countries.

CONCLUSION

In summary, we call for greater collaboration among international HLIUs. Increased networking of these units can create more synergistic working relationships in this unique space, highlight the value of increased investment into high-level isolation capability for HCID preparedness and for other epidemic and pandemic threats, and further advocate for incorporating these capabilities into national health plans. More formalized networking of global HLIUs could also serve as a platform for mentoring and consultation services for institutions or nations looking to expand high-level isolation capabilities, with the recognition that the maturity of an HLIU is likely to fit within the context of a health system and its contributions to health security, which varies by country. While we have outlined 3 potential outcomes of such collaboration, we acknowledge and encourage that such networking could further advance the field of high-level isolation and HCID readiness well beyond those we have discussed.

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