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Nurses at the frontline of public health emergency preparedness and response: lessons learned from the HIV/AIDS pandemic and emerging infectious disease outbreaks

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The years 2020–21, designated by WHO as the International Year of the Nurse and Midwife, are characterised by unprecedented global efforts to contain and mitigate the COVID-19 pandemic. Lessons learned from successful pandemic response efforts in the past and present have implications for future efforts to leverage the global health-care workforce in response to outbreaks of emerging infectious diseases such as COVID-19. Given its scale, reach, and effectiveness, the response to the HIV/AIDS pandemic provides one such valuable example, particularly with respect to the pivotal, although largely overlooked, contributions of nurses and midwives. This Personal View argues that impressive achievements in the global fight against HIV/AIDS would not have been attained without the contributions of nurses. We discuss how these contributions uniquely position nurses to improve the scale, reach, and effectiveness of response efforts to emerging infectious diseases with pandemic potential; provide examples from the responses to COVID-19, Zika virus disease, and Ebola virus disease; and discuss implications for current and future efforts to strengthen pandemic preparedness and response.

Introduction

WHO designated 2020–21 as the International Year of the Nurse and Midwife. These years are also characterised by global efforts to contain and mitigate the COVID-19 pandemic. The full extent of COVID-19-related morbidity and mortality, along with the pandemic's long-term socioeconomic and political fallout, are not yet fully foreseeable but are projected to be wide-ranging and transformative, including the looming regression of the UN Sustainable Development Goals.¹ Infectious disease models suggest that achieving a complete epidemic fade-out in the near future will be challenging, and sustained global efforts to fight recurring outbreaks are probably needed until sufficient people acquire durable immunity through infection or vaccination.² Efforts to leverage the global health-care workforce in response to emerging infectious diseases such as COVID-19 should consider the lessons from successful pandemic responses in the past and present. The four-decade-long global fight against HIV/AIDS is one such valuable example, especially with respect to the pivotal, although largely overlooked, contributions of nurses and midwives (hereafter collectively called nurses) to the scale, reach, and effectiveness of the response.

We argue that impressive achievements, in terms of the scale, reach, and effectiveness of the response to HIV/AIDS, would not have been attained without nurses. Furthermore, we discuss how these contributions uniquely position nurses to improve the response to emerging infectious diseases with pandemic potential, we provide examples from the responses to COVID-19, Zika virus disease, and Ebola virus disease, and we discuss lessons learned from these nursing contributions for current and future public health emergency

preparedness.

Nursing contributions to the HIV/AIDS pandemic response

The global fight against HIV/AIDS has been a workforce-intensive effort. Strategies to curb the pandemic, including the UNAIDS 95-95-95 framework, rely on large-scale, population-level HIV testing, universal access to antiretroviral therapy (ART), and sustained viral suppression among individuals on ART.³ With an estimated 38 million people with HIV globally, of whom more than 7 million are unaware of their HIV status, efforts to scale-up HIV testing and treatment have burdened health-care systems in resource-limited settings.⁴

Despite this burden, impressive progress in HIV testing, treatment, and viral suppression has been achieved. In 2019, an estimated 81% of all people with HIV were aware of their status compared with 70% in 2015, 82% of people aware of their HIV infection were receiving ART compared with 68% in 2015, and 88% on ART had viral suppression compared with 82% in 2015.^{4,5} In many regions worldwide, nurses—who constitute more than half of the global health-care workforce⁶—form the backbone of increasingly successful HIV service delivery systems, particularly in the most heavily affected regions.^{7,8} The contributions of nurses have been particularly valuable in three key areas of HIV service delivery: scale, reach, and effectiveness.

Scale

The number of people globally who are tested for HIV and receive ART has substantially grown over the past 15 years.^{9,10} WHO data for 77 countries suggest a 33% increase between 2009 and 2013 in people tested for

Lancet Infect Dis 2021; 21: e326–33

Published Online
March 18, 2021
[https://doi.org/10.1016/S1473-3099\(20\)30983-X](https://doi.org/10.1016/S1473-3099(20)30983-X)

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HIV annually.⁹ Continued global demand growth for rapid HIV tests is projected, increasing by 26%—from 405 million in 2016 to 509 million in 2021.¹¹ Similarly, since 2005, the number of people on ART worldwide has increased by more than 20 million, with a three-fold increase between 2010 and 2019.¹⁰

In particular, task-shifting from physicians to nurses and from nurses to lay health-care workers, such as counsellors and community health workers, has emerged as an effective strategy for the scale-up of health services in low-income and middle-income countries (LMICs),¹² including for HIV testing and treatment.^{12–14} With this framework, the nursing workforce can be leveraged for large-scale HIV treatment service delivery in high-burden settings, with lay health-care workers offsetting the resulting increases in workload. In a systematic review of task-shifting that found efficiency improvements and cost-savings in HIV service delivery, six of seven studies on HIV services evaluated task-shifting approaches in which nurses were responsible for either direct service delivery or training or oversight of lay health-care workers.¹² Research systematically examining the relative contributions of nurses and lay health-care workers across task-shifting models is largely missing from the extant literature.

Nurse-managed HIV care approaches, in which nurses directly deliver services or oversee service delivery by lay health-care workers, are particularly important in the regions with the highest HIV prevalence, given that countries that dispense the largest volumes of ART have among the lowest physician-to-patient ratios. The median density of physicians in the ten countries with the most individuals on ART (South Africa, Mozambique, Tanzania, Uganda, India, Zimbabwe, Nigeria, Kenya, Zambia, and Malawi)¹⁵ is only 1.9 physicians per 10 000 population, compared with a median of 11.2 nurses and midwives per 10 000.¹⁶ In these contexts, nurses ensure functionality of HIV service systems with high patient volume.¹⁷ In response to physician shortages, WHO guidelines for decentralisation of HIV services in resource-limited settings recommend that nurses take on broader responsibilities, including testing, treatment initiation, integration of HIV services into antenatal, labour and delivery, postpartum, and newborn care for prevention of mother-to-child transmission, health centre management, and physician referral of complex cases.¹⁸ Since 2010, national policy changes in South Africa that promote ART initiation by nurses to accelerate the scale-up of the country's ART programme exemplify this approach,¹⁹ for which effectiveness has been validated in a large-scale randomised trial.²⁰

Reach

Nowadays, the vast majority of people with HIV live in LMICs, with sub-Saharan Africa alone accounting for more than two-thirds of the global HIV prevalence.²¹ Notably, in many LMICs, a sizeable proportion of individuals with HIV reside in remote and resource-limited settings where

access to health care remains inadequate.⁴ Despite persistent barriers to health care for half of the world's population,²² access to HIV testing and treatment in these hard-to-reach settings has been expanded substantially through decentralised and community-based HIV service delivery models.²³ For example, decentralised testing delivered by nurses in a rural Nigerian health facility improved testing rates among attending children and adolescents younger than 20 years to 94%, from a baseline of 8% with the previous testing approach based on laboratory personnel.²⁴ Similarly, community-based HIV testing, such as an initiative in Tanzania delivered by nurses and lay counsellors,^{25,26} has led to higher testing rates in countries with both generalised and concentrated epidemics and is recommended by WHO.^{9,27}

Community-based models for ART delivery, credited for substantially increasing access to ART in remote and resource-limited settings,^{23,28,29} also frequently rely on nurses for service delivery or nurse-managed HIV care.^{12,30} In South Africa, a randomised trial on community-based ART initiation and refills delivered by nurses and supervised lay counsellors showed superior viral suppression (74%) compared with clinic-based services (63%).³¹ In central Asia, the implementation of home-based HIV care delivery by nurses between 2015 and 2016 increased the number of patients engaged in HIV care by 33% and on ART by 48%.³² In recognition of successful nurse-led and community-based HIV prevention, care, and treatment delivery models, the US President's Emergency Plan for AIDS Relief advocates adopting rural community-based practical training for nurses in countries with high HIV prevalence.³³

Effectiveness

Despite the importance of universal access to HIV testing and treatment, access alone is not enough to attain the 95-95-95 goals. Newly diagnosed individuals need to be navigated to HIV treatment services for ART initiation. Subsequently, retention-in-care and ART adherence are necessary for achieving sustained viral suppression. However, attaining adequate rates of linkage to care, retention in care, and medication adherence for people with HIV is challenging, even in contexts with comparatively well resourced health-care infrastructures.³⁴ Testing and treatment disparities exist for subpopulations in need of targeted programmes and tailored HIV service delivery models. For example, in the USA, adolescents and young adults with HIV aged 13–24 years are more likely to be unaware of their status, less likely to be virally suppressed, and more likely to transmit the virus than older-aged cohorts.^{35,36} Similar disparities have been documented globally for adolescents and young adults, and for other key populations such as people who use drugs, indicating the importance of effective HIV service delivery models.^{37,38}

Nurses have long pioneered innovative and effective HIV care models. For example, the world's first HIV

specialty care unit—the nurse-led Ward 5B of the San Francisco General Hospital, San Francisco, CA, USA, established in 1983 during the height of the epidemic in the USA—pioneered a compassionate model of HIV care that was the first to address the role of stigma in HIV service delivery.³⁹ Nowadays, the association between stigma and negative health outcomes among people with HIV is widely acknowledged.⁴⁰ Nurse-managed HIV care approaches have had patient outcomes that are either similar or superior to those of physicians for various conditions,⁴¹ including equal AIDS-related mortality and improved retention in care for nurse-initiated and nurse-managed ART.⁴²

Nurses have been at the forefront of the development and implementation of innovative and differentiated HIV care models.⁴³ These care models are tailored to the unique needs of key populations and have shown improved treatment outcomes in resource-limited settings.^{43–45} Similar to task-shifting approaches in standard HIV service delivery, nurses assume a wider range of responsibilities in differentiated HIV care models, including nurse-managed care and delivery of behavioural interventions.⁴³ For example, nurse interventionists trained as linkage coordinators had an 84.4% linkage-to-HIV-care rate among recently diagnosed adults in Ukraine between 2015 and 2018, more than half of whom presented with depression and a quarter of whom were recruited from substance use dependence clinics, compared with a 33.8% linkage-to-HIV-care rate in the control condition.⁴⁶ In a randomised controlled trial in South Africa, a differentiated HIV-care approach relying on nurses for point-of-care viral load testing, same-day counselling, and task-shifted care showed 93% viral suppression compared with 83% viral suppression in the standard-of-care group.⁴⁷ In high-income contexts, differentiated care models warrant further exploration as they are increasingly recognised as promising but understudied approaches for reducing HIV treatment disparities.⁴⁸

Leveraging nurses for the response to emerging infectious diseases

There are several examples of nurses contributing to emerging infectious disease response efforts, such as during the COVID-19 pandemic, the 2015–17 Zika virus disease outbreak in the Americas, and the 2014–16 Ebola virus disease outbreak in west Africa. We provide case examples of how contributions from nurses have expanded the scale, reach, and effectiveness of emerging infectious disease response efforts and discuss lessons learned from these examples to inform ongoing and future responses.

COVID-19 case example: scale

In response to the rapid spread of COVID-19, health-care systems worldwide have quickly expanded capacity for inpatient and intensive care.^{49,50} Nevertheless, steep epidemic curves in the worst-affected countries have

overwhelmed health-care systems, including in well resourced countries.⁴⁹ To date, nurses have provided a large portion of direct patient care for patients with COVID-19, including those with severe disease.⁵¹ Nurses are the largest segment of the health-care workforce in most countries, and in the USA, nurses have been estimated to account for 86% of care time in intensive care units.⁵² Acute shortages in health-care personnel and medical equipment have contributed to substantial COVID-19 morbidity and mortality in the most heavily affected countries.^{53,54} Important to note, nurses globally are at elevated risk of COVID-19 and account for disproportionately high mortality.⁵⁵

Zika virus disease case example: reach

Between 2015 and 2016, a large-scale Zika virus disease outbreak occurred in the Americas, and the associated increase in congenital Zika syndrome and birth defects, such as microcephaly, drew global and public health attention.⁵⁶ In many affected areas, particularly rural and remote areas, and socioeconomically susceptible urban communities, nurses formed the backbone of services providing Zika virus disease treatment, management of Zika-related birth defects, and prevention education for high-risk individuals, such as pregnant women.^{57–59} Retrospective analyses of the response efforts suggest the slow dissemination of emerging scientific evidence and evolving practice recommendations impeded the mitigation of Zika virus disease.^{58,59} In particular, nurses and other health-care providers in remote and medically underserved areas reported inadequate preparation in providing quality patient education and care for susceptible populations.^{59,60} To address this challenge, the University of California, San Francisco, CA, USA, established a Zika response nurse coordinator during the height of the outbreak in 2016.^{61,62} This role included provision of subject matter expertise to health-care providers in the region, development of infrastructure for Zika testing, and patient education resources, and represents an important case example for broad adoption.^{61,62}

Ebola virus disease case example: effectiveness

The 2014–16 west African Ebola virus disease outbreak, totalling nearly 29 000 cases with more than 11 000 deaths,⁶³ was the deadliest emerging infectious disease outbreak since the advent of the HIV/AIDS pandemic in the 1980s and before the COVID-19 pandemic. Structural health-care system weaknesses in the three most heavily affected countries—Sierra Leone, Liberia, and Guinea—including shortages in health-care personnel and equipment, weak systems for surveillance and communication of public health messages, and widespread health system mistrust, exacerbated its impact.^{64,65} Health-care workers—nurses particularly—were exposed to substantially increased risk of contracting Ebola virus, resulting in substantial mortality and psychological trauma.^{66–68} Nevertheless, thousands of nurses continued to provide treatment and

palliative care to patients with Ebola virus disease, evolved care protocols to decrease occupational exposure, and worked with communities to increase trust until the outbreak was controlled.^{68–70}

Lessons learned from emerging infectious disease outbreaks and implications for the future

The contributions of nurses to the fight against HIV/AIDS and other infectious disease outbreaks yield valuable lessons for current and future efforts to strengthen scale, reach, and effectiveness of pandemic preparedness and response, including for the COVID-19 pandemic (table). Despite the indispensable role of nurses in responding to past and ongoing infectious disease threats, their contribution is too often overlooked. Important barriers to fully leveraging nurses in infectious disease outbreak preparedness and response remain in place, such as low professional status, restricted autonomy in practice, and inadequate representation of nurses in public health and policy leadership. To strengthen the global nursing workforce, action in eight domains is warranted.

Increasing targets for nursing workforce growth

WHO estimates that nearly 40 million nurses will be needed by 2030 to eliminate global shortages in the

nursing workforce.⁷¹ Most of the anticipated need in nursing workforce growth is accounted for by LMICs, where health-care systems need to expand capacities irrespective of the COVID-19 pandemic.⁷¹ However, a strong nursing workforce for response to surging patient volumes in public health emergencies is needed in both high-income countries and LMICs. Therefore, the targets for global nursing workforce growth should be re-evaluated by heeding the added need for nurses in pandemic preparedness, beyond routine health-care delivery.

Removal of barriers to expand nurses’ scope of practice

The expansion of nurses’ scope of practice through task-shifting and nurse-managed care has shown positive outcomes for HIV and other infectious diseases in strained health-care systems, primarily in LMICs. Outbreaks of emerging infectious diseases with pandemic potential, which are projected to occur with increasing frequency,⁷² overwhelm health-care systems in LMICs and high-income countries alike.^{53,54} Regulatory, administrative, and other barriers interfering with autonomous nursing practice, such as inadequate remuneration, hinder the response to public health emergencies and should be removed.

Nursing lessons learned		Implications for preparedness and response
Scale		
Keeley et al ⁵⁰	COVID-19: the expansion of the nursing workforce was needed to respond to surges of cases in areas most heavily affected by the COVID-19 pandemic	Global targets for nursing workforce growth should consider the added need for nurses in pandemic preparedness and response beyond routine health-care delivery
Colvin et al ¹⁹ and Fairall et al ²⁰	HIV: task-shifting and nurse-managed care was effective for expanding health-care system capacity and scaling up HIV care	Barriers to expanding nurses’ scope of practice should be removed to facilitate task-shifting in strained health-care systems
Reach		
Dran ⁶¹ and Kalantari ⁶²	Zika virus disease: a Zika response nurse coordinator at the University of California, San Francisco, CA, USA, established in 2016 during the height of the outbreak, supported capacity for Zika virus disease response in underserved communities by compiling and disseminating up-to-date scientific evidence	Improved infrastructure for timely dissemination of evolving practice recommendations is needed; features that allow for widespread use by nurses in peripheral health facilities should be prioritised in the development of new medical technologies
Barnabas et al ³¹	HIV: community-based service delivery by nurses and lay health-care workers has substantially decreased access barriers to HIV services in low-income and middle-income countries	Nurse-led service delivery models in community and household settings can reduce access disparities for infectious disease prevention and treatment, but remain underutilised in high-income countries
Effectiveness		
All-Party Parliamentary Group on Global Health ⁶⁸ and Wilson ⁶⁹	Ebola virus disease: nurses, as the largest segment of the frontline workforce, contributed important perspectives to evolving on-the-ground Ebola virus disease response protocols and revisions of international pandemic preparedness plans after outbreaks	Greater representation of nurse leaders in public health emergency planning and decision making can improve the response to current and future pandemics
Wilson ⁶⁹ and McMahon et al ⁷⁰	Ebola virus disease: nurses contributed to improving public health communication in a context of substantial health system mistrust	Nurses consistently rank among the most trusted professions globally and should be leveraged in public health messaging
Lucas ³⁹	HIV: during the height of the epidemic in the USA, the nurse-led Ward 5B at the San Francisco General Hospital, San Francisco, CA, USA, pioneered a compassionate model of HIV care that was first to address the role of stigma in HIV service delivery globally	Research to develop novel and nurse-led care delivery models in response to emerging infectious diseases is needed
Said and Chiang ⁹⁷	Public health emergencies (general): inadequate training and psychological preparedness has been identified as primary challenges for nurses in public health emergency response, including to infectious disease outbreaks	Inclusion of emergency preparedness in nursing curricula, training, and capacity building is warranted given the role of nurses at the frontline of pandemic response

Table: Nursing lessons learned from infectious disease outbreaks and the implications for pandemic preparedness and response

Infrastructure for timely dissemination of evolving practice recommendations and medical innovations

Delays in the dissemination and adaptation of evolving evidence-based practice recommendations and medical innovations to under-resourced and peripheral health facilities that largely rely on nurses for health-care delivery have hindered infectious disease response efforts.^{58–60,73} Designated coordinating centres for support of remote health-care providers, particularly as infrastructure for increasing reach of evolving evidence in care, are needed. Features that allow for widespread use by nurses in peripheral health facilities should be prioritised in the development of new medical technologies, including considerations such as transport and refrigeration, suitability for outpatient procedures, and usability without specialised training.

Decentralised nurse-led service delivery models in community and household settings

In LMICs, nurses, particularly in collaboration with lay health-care workers, are instrumental in implementing decentralised infectious disease treatment and prevention services that reduce access disparities. In both LMICs and high-income countries, pandemics and outbreaks disproportionately affect socioeconomically susceptible populations with inadequate health-care

access.⁷⁴ For high-income countries, adoption of decentralised, nurse-led service delivery models in community and household settings represents an opportunity to draw on lessons learned from LMICs for application in response to the COVID-19 pandemic. An ongoing project in the Rapid Acceleration of Diagnostics in Underserved Populations initiative in the USA represents an example of increasing recognition for this approach in high-income settings (figure).⁷⁵

Nurse leadership in planning and decision making

Given nurses' central role to the scale, reach, and effectiveness of response measures to infectious disease outbreaks, representation of nurse leaders in public health emergency planning is needed to optimally manage future outbreaks. However, nurse representation in leadership roles is too often inadequate.⁶⁸ Participation of nurses in decision-making roles for strengthening health-care facility resilience, development of emergency plans and protocols, including for acquisition and distribution of personal protective equipment, training and education of staff, management of urgent care in outbreak situations, communication with the public, and evaluation and revision of emergency plans after an outbreak is warranted.⁷⁶

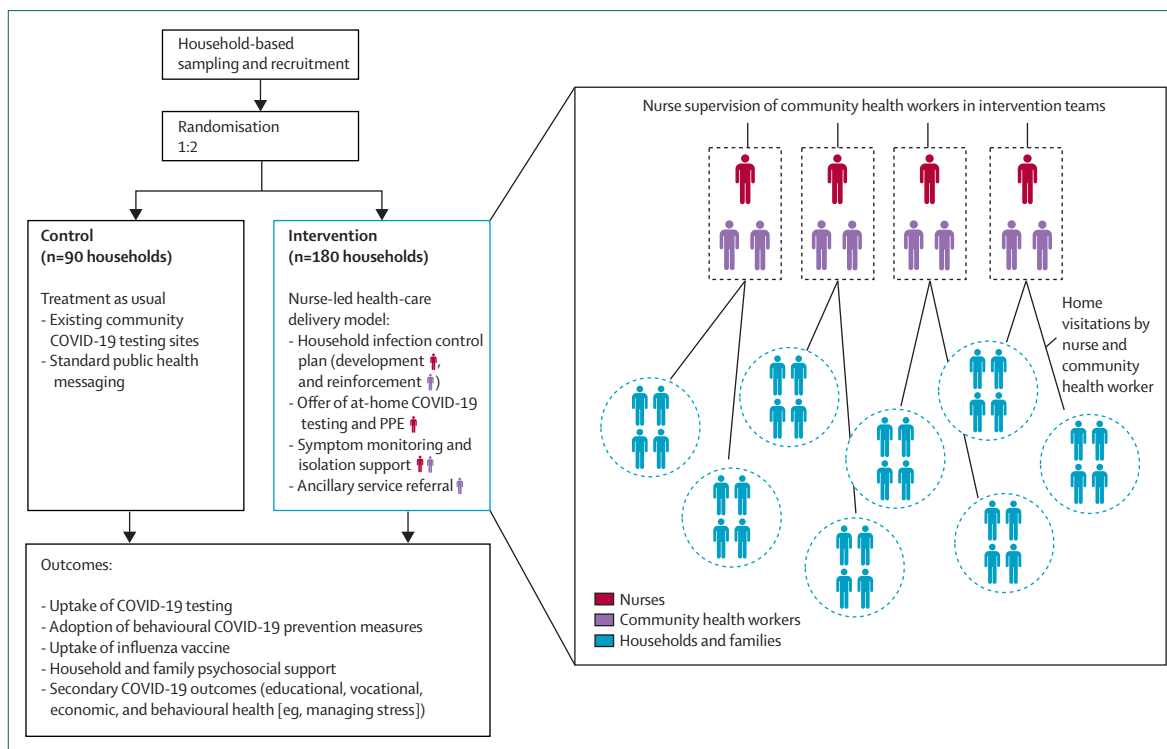


Figure: Example of a decentralised, nurse-led health-care delivery model in community and household settings for COVID-19 testing and prevention in Bronx, New York, NY, USA

The figure represents an ongoing project of the US National Institutes of Health Rapid Acceleration of Diagnostics in Underserved Populations initiative (NIDA-3P30 DA011041-23S1). Intervention delivery is supervised by nurses, with tasks that do not require nurse training shifted to community health workers (respective intervention delivery roles of nurses and community health workers are indicated by colour-coded figures).

Nurses in public health communication

Globally, nurses consistently rank among the most trusted professions.⁷⁷ During pandemics and infectious disease outbreaks, nurses have had important roles in direct communication of public health information and education to patients and communities, for example, through community-based work to reduce health system mistrust during the 2014–16 Ebola virus disease outbreak.^{69,70} Increased involvement and visibility of nurses in public health communication campaigns at the population level represents a promising strategy to address public mistrust.

Nurse-led research to improve resilience of health systems

The psychological and technical challenges of infectious disease outbreak response for nurses and resulting mortality risk and attrition have been well established.^{64–67}

Nurse-led research to further understand the facilitators of, and barriers to, optimal nursing care in emergency situations is needed to inform the development of resilient health systems and improve outcomes. The ongoing overhaul of the National Institute of Nursing Research's strategic plan in the USA represents an important opportunity to advance this research.⁷⁸

Emergency preparedness in nursing training

Given that nurses are frequently first responders to outbreaks of emerging infectious diseases, an increased emphasis on public health emergency preparedness in nursing education and provision of ongoing training and capacity building is warranted. The psychological and technical challenges of public health emergency response should be reflected in nursing curricula worldwide.

Conclusion

Nurses have substantially contributed to the scale, reach, and effectiveness of outbreak response measures, including measures for the COVID-19 pandemic and Zika virus disease and Ebola virus disease outbreaks, and have been at the forefront of the global fight against HIV/AIDS for four decades. However, the role of nurses has been too often overlooked. Important lessons learned from past and ongoing outbreaks and pandemics warrant action in order to fully realise the potential of nurses for improving preparedness and response to emerging infectious diseases. Altogether, increased acknowledgment of nurses as key actors in the scale, reach, and effectiveness of pandemic and outbreak responses is needed.

Contributors

VG-R and MT-K conceptualised and drafted the initial manuscript, interpreted the data reported in the manuscript, and reviewed and revised the manuscript. AB and AH assisted with the interpretation of the data reported in the manuscript and reviewed and revised the manuscript. YL, ST, MdLRL, ABS, and HH assisted with the conceptualisation of the manuscript and reviewed and revised the manuscript. All authors approve the final manuscript as submitted and agree to be accountable for all aspects of the work.

Declaration of interests

VG-R reports grants and personal fees from ViiV Healthcare, outside the submitted work, and serves as a member of the US Presidential Advisory Council on HIV/AIDS and as the vice chair of the Board of Directors of the Latino Commission on AIDS. All other authors declare no competing interests.

Acknowledgments

This research was supported by the US National Institutes of Health (3P30 DA011041-23S1) and the Center for Drug Use and HIV Research (CDUHR-P30 DA011041). The funding bodies did not influence the content or opinions expressed in this manuscript.

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