Rapid Expert Consultation on Understanding Causes of Health Care Worker Deaths Due to the COVID-19 Pandemic (December 10, 2020) (2020)

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CONTRIBUTORS

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December 10, 2020

Robert Kadlec, M.D.
Assistant Secretary for Preparedness and Response
200 Independence Avenue, SW
Washington, DC 20201

Dear Dr. Kadlec:

Attached please find a rapid expert consultation on health care worker (HCW) morbidity and mortality due to COVID-19 that was prepared by Sue Anne Bell, and Matthew Wynia, with input from John Hick, and conducted under the auspices of the National Academies of Sciences, Engineering, and Medicine's Standing Committee on Emerging Infectious Diseases and 21st Century Health Threats.

This rapid expert consultation describes what we know about the extent of deaths and mental health impairments among HCWs due to COVID-19. The document stresses the advantages that could follow from more complete national data on the scope of the problem. Building on such a data system, focused epidemiological studies can better home in on measures that will protect the health and well-being of the health care workforce.

A healthy health care workforce is vital to the nation's response to the COVID-19 pandemic. We hope the assessment in this rapid expert consultation can help protect the HCWs who care for all of us.

Sincerely,

Harvey V. Fineberg, M.D., Ph.D.
Chair
Standing Committee on Emerging Infectious Diseases and 21st Century Health Threats

INTRODUCTION

The COVID-19 pandemic has created both acute and chronic stresses on the health care system and on health care personnel nationwide. At present, the nation lacks a uniform system to collect, collate, and report illnesses and deaths among HCWs due to COVID-19.

As with COVID-19, past epidemics have severely harmed HCWs. During the first severe acute respiratory syndrome (SARS) epidemic in 2003, HCWs accounted for 1,707 (21 percent) of 8098 cases globally.[1] The 2014–2016 Ebola virus outbreak in West Africa also disproportionately affected health care professionals. Liberia saw more than 8 percent of its health care population killed by the disease, compared to 0.11 percent of its general population. Comparable statistics were also observed in Sierra Leone and Guinea, where 0.06 percent and 0.02 percent of the population infected with Ebola virus disease (EVD) died versus 6.7 percent and 1.45 percent of HCWs with EVD, respectively.[2] Data detailing the disproportionate effects on HCWs are only now emerging for the COVID-19 pandemic. A report published in *Morbidity and Mortality Weekly Report* on October 30 analyzed 6,760 COVID-19 hospitalizations that occurred between March 1 and May 31, 2020, and noted that 6 percent of infections were among health care professionals. The report also found that nearly 28 percent of them had severe illnesses and were ultimately admitted to an intensive care unit.[3]

Evidence suggests that COVID-19 infection is more prevalent among HCWs who lack appropriate personal protective equipment (PPE) or in work settings without a universal mask mandate. Whether an individual HCW's infection originated in the workplace or in the community may be uncertain. As described below, only a few studies report on efforts to improve the health and well-being of HCWs during the COVID-19 pandemic.

At the request of the U.S. Department of Health and Human Services' Office of the Assistant Secretary for Preparedness and Response, this rapid expert consultation reviews current resources and methods for tracking and evaluating HCW deaths related to COVID-19 in the health care setting. As outlined in the Statement of Task in Box 1, deaths related to COVID-19 among HCWs include deaths due to occupational exposure directly to COVID-19 and deaths that could reasonably be attributed to conditions exacerbated by COVID-19, such as HCW suicides due to fatigue, stress, or burnout. This rapid expert consultation also examines some ways to support HCW well-being and safety during the pandemic.

[1] World Health Organization. 2003. World Health Organization summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003. http://www.who.int/csr/sars/country/table2003_09_23/en/External Link (accessed December 4, 2020).
[2] Evans et al. 2015. Healthcare worker mortality and the legacy of the Ebola epidemic. *The Lancet Global Health* 3(8). https://doi.org/10.1016/S2214-109X(15)00065-0.
[3] Kambhampati et al. 2020. COVID-19–associated hospitalizations among health care personnel—COVID-NET, 13 States, March 1–May 31, 2020. *Morbidity and Mortality Weekly Report* 69:1576–1583. http://dx.doi.org/10.15585/mmwr.mm6943e3.

BOX 1
Statement of Task

As of August 24 *Kaiser Health News* and *The Guardian* report more than 900 potential deaths of health care workers (HCWs) in the United States related to COVID-19. At the request of the Office of the Assistant Secretary for Preparedness and Response at the U.S. Department of Health and Human Services, the National Academies of Sciences, Engineering, and Medicine's Standing Committee on Emerging Infectious Diseases and 21st Century Health Threats will provide a rapid expert consultation addressing potential methods to better track and understand the causes of HCW deaths due to COVID-19, and assess the impact of the SARS-CoV-2 pandemic on the physical and mental health of HCWs.

The consultation should include a review of current resources and methods for tracking and evaluating HCW deaths related to COVID-19, as well as consideration of potential best practices. COVID-19-related deaths among HCWs should be construed broadly as including

- Deaths due to occupational exposure to COVID-19;
- Deaths that could be reasonably assumed to be due to conditions exacerbated by fatigue, stress, or burnout; and
- HCW suicides from March 2020 to present.

The consultation should also assess potential strategies, interventions, and lessons learned in the support of HCW well-being.

The rapid expert consultation will be conducted in accordance with the policies and procedures of the National Academies including approval of the Report Review Committee prior to release.

This rapid expert consultation adopts the definition of "health care worker" employed by the U.S. Centers for Disease Control and Prevention (CDC), as outlined in Box 2.

BOX 2
U.S. Centers for Disease Control and Prevention (CDC) Definition of Health Care Personnel

"**Health care personnel (HCP)** refers to all paid and unpaid persons serving in health care settings who have the potential for direct or indirect exposure to patients or infectious materials, including body substances (e.g., blood, tissue, and specific body fluids); contaminated medical supplies, devices, and equipment; contaminated environmental surfaces; or contaminated air. These HCP may include, but are not limited to, emergency medical service personnel, nurses, nursing assistants, physicians, technicians, therapists, phlebotomists, pharmacists, students and trainees, contractual staff not employed by the health care facility, and persons (e.g., clerical, dietary, environmental services, laundry, security, maintenance, engineering and facilities management, administrative, billing, and volunteer personnel) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted among HCP and patients."[a]

[a] CDC. Infection control—Appendix 2 terminology: Glossary of terms. https://www.cdc.gov/infectioncontrol/guidelines/healthcare-personnel/appendix/terminology.html (December 4, 2020).

CURRENT REPORTING OF DEATHS FROM COVID-19 AMONG HEALTH CARE WORKERS

In the context of categories of harm assigned by the Occupational Safety and Health Administration (OSHA), a death due to COVID-19 could be classed among those due to "exposure to harmful substances or environments."[4] Notably, no OSHA category counts deaths specifically from occupationally acquired infection. When a recognized incident, such as a needle stick, leads to illness and death in an HCW, the occupational source is clear. However, when an infectious disease is circulating in the community, it may not be possible to trace individual cases among HCWs to occupational rather than community exposure. Although this may leave any single case uncertain in origin, measures such as excess disease, hospitalization, and death among HCWs compared to the general public could indicate the added risk overall due to occupational exposure.

Risks to HCWs are particularly likely to be under-reported during public health emergencies, and this continues to be true today amid the COVID-19 pandemic.[5] As of November 3, 2020, the CDC COVID Data Tracker webpage reported 786 HCW deaths attributable to infection with COVID-19.[6] CDC's mechanism for collecting information about HCW infections currently relies on coronavirus case report forms, typically completed by local health departments. HCW occupation type and job setting were not added to the case report form until May 2020, and these data continue to be frequently missing. Among the 2,633,585 U.S. COVID-19 cases reported toCDC from February 12 to July 16, 2020, occupational status was available for only 22 percent (571,708) of cases, among whom 100,481 (18 percent) were identified as "health care personnel" (see Box 2). Data requirements vary by state. For example, Arizona does not currently report COVID-19 death data by profession, and while states like Florida and Michigan do provide data about certain types of HCWs, such as staff in long-term facilities, they do not report on other types of HCW.[7] On top of this range in data standards, data completeness varies greatly by jurisdiction.

Reporting of COVID-19 infections and deaths among nursing home staff has improved because of a rule, implemented in May 2020, by the Centers for Medicare & Medicaid Services (CMS). This ruling requires long-term care facilities to report COVID-19 infections and potential outbreaks directly to CDC in a standardized format and at a frequency defined by both CMS and

[4] OSHA, part of the U.S. Department of Labor, categorizes deaths into one of six distinct categories: transportation accidents, assaults and violent acts, contact with objects and equipment, falls, exposure to harmful substances or environments, and fires and explosions. U.S. Department of Labor Occupational Safety and Health Administration. 2020. 1904.8—Recording criteria for needlestick and sharps injuries. https://www.osha.gov/laws-regs/regulations/standardnumber/1904/1904.8 (December 4, 2020).
[5] Sepkowitz, K. A., and L. Eisenberg. 2005. Occupational deaths among healthcare workers. *Emerging Infectious Diseases* 11(7):1003–1008. https://dx.doi.org/10.3201/eid1107.041038.
[6] CDC. 2020. CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#health-care-personnel (December 4, 2020).
[7] AARP. 2020. How to track COVID-19 nursing home cases and deaths in your state. https://www.aarp.org/caregiving/health/info-2020/coronavirus-nursing-home-cases-deaths.html (December 4, 2020).

CDC.[8] Failure to report can result in enforcement actions. While this ruling required reporting starting in May 2020, nursing home facilities have had the option to report cumulative data retrospectively back to January 1, 2020, and not all facilities chose to, or could do so. As of July 26, 2020, the CMS database reported a total of 12,348 HCW deaths due to confirmed or suspected COVID-19. This database does not specify whether infections originated at work or in the community.[9]

The absence of a uniform national framework and inconsistent requirements across states for collecting, recording, and reporting HCW mortality and morbidity data associated with COVID-19 impairs anyone's ability to make comparisons, do combined analyses, or draw conclusions about the scale of the problem. Promulgation of a robust national data reporting system, including collection of data on circumstances and interventions that may raise or lower risk, as well as data on where the infection occurred, would support the adoption of effective mitigation strategies and policies to reduce COVID-19 mortality and morbidity in HCWs. Apart from a national reporting system, epidemiological studies on risk factors for HCWs such as face-to-face contact with COVID-19 patients, availability and use of PPE, and institutional requirements for masking could also be informative for policy and practice. Some lessons from a previous National Academies report on tracking mortality during disasters may be relevant to COVID-19 (see Appendix A).

MENTAL HEALTH IMPACT OF COVID-19

Data to assess the impact of the COVID-19 pandemic on the mental health of HCWs such as the prevalence of burnout and suicide, while limited, point to a serious concern.[10] A March 2020 study of HCWs at the forefront of the COVID-19 crisis in China found significant mental and psychological effects such as anxiety, depression, insomnia, and distress.[11] This echoes past pandemics, such as the 2003 SARS outbreak in Toronto, where one-third of 1,557 HCWs surveyed reported posttraumatic stress symptoms at levels comparable to those of victims of a large-scale natural disaster.[12]

Even in the absence of a pandemic such as COVID-19 or a local SARS outbreak, mental health risks among HCWs are high. In 2017, 44 percent of physicians reported experiencing symptoms of burnout, as defined in the emotional exhaustion and depersonalization scales of the Maslach

[8] CMS. 2020. Interim final rule updating requirements for notification of confirmed and suspected COVID-19 cases among residents and staff in nursing homes. https://www.cms.gov/files/document/qso-20-29-nh.pdf (December 4, 2020)
[9] CMS. 2020. COVID-19 nursing home dataset. https://data.cms.gov/Special-Programs-Initiatives-COVID-19-Nursing-Home/COVID-19-Nursing-Home-Dataset/s2uc-8wxp (December 4, 2020)
[10] Shreffler et al. 2020. The impact of COVID-19 on healthcare worker wellness: A scoping review. *The Western Journal of Emergency Medicine* 21(5). https://doi.org/10.5811/westjem.2020.7.486847514392.
[11] Lai et al. 2020. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Network Open* Mar 2;3(3). doi: 10.1001/jamanetworkopen.2020.3976. PMID: 32202646; PMCID: PMC7090843.
[12] Maunder, R. 2003. The experience of the 2003 SARS outbreak as a traumatic stress among frontline healthcare workers in Toronto: Lessons learned. *Philosophical Transactions of the Royal Society B: Biological Sciences* 359(1447). doi: 10.1098/rstb.2004.1483. PMID: 15306398; PMCID: PMC1693388.

Burnout Inventory.[13] Other studies have shown that women in the health care workforce are especially at risk of death by suicide; with female registered nurses ranking in the top six major occupational groups with higher rates of suicides.[14] Similarly, a pre-COVID-19 meta-analysis has shown that physicians died by suicide at a higher rate than the general population.[15,16]

The full scope of the mental health burden imposed by COVID-19 on HCWs is uncertain. As with mortality due to COVID-19, there are currently no national systems nor reporting standards for morbidity measures related to the pandemic, such as mental health status, provider well-being, and other psychological effects on HCWs.

In August 2020, the National Academy of Medicine's (NAM's) Action Collaborative on Clinician Well-Being and Resilience[17] stressed that the nation is facing a surge of physical and emotional harm that amounts to "a parallel pandemic" and "must take responsibility for the well-being" of HCWs, clinicians in particular, responding to COVID-19.[18] While some mitigation strategies are necessary at the organizational level, the NAM Action Collaborative called for several immediate actions at the national level to lay the groundwork for a clear and accountable strategy to safeguard the health and well-being of the health care workforce. These include the implementation of a national epidemiologic tracking program to measure HCW well-being, assess the acute and long-term effects of COVID-19 on HCWs, and report on the outcomes of interventions. The NAM Action Collaborative noted that such a national program, ideally headed by CDC, is needed to comprehensively acknowledge the scale of the COVID-19 crisis and protect the health care workforce that is already stretched to the breaking point in many locations.[19]

UNIVERSAL MASKING AND PERSONAL PROTECTIVE EQUIPMENT AS A MEANS OF PROTECTING HEALTH CARE WORKERS

Several studies point to ways to protect and support HCWs from transmissible diseases, including infection control practices, PPE use, and universal masking.

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[13] Shanafelt et al. 2019. Changes in burnout and satisfaction with work-life integration in physicians and the general US working population between 2011 and 2017. *Mayo Clinic Proceedings* 94(9). https://doi.org/10.1016/j.mayocp.2018.10.023.

[14] Peterson et al. 2020. Suicide rates by industry and occupation: National Violent Death Reporting System, 32 States, 2016. *Morbidity and Mortality Weekly Report* 69:57–62. http://dx.doi.org/10.15585/mmwr.mm6903a1.

[15] Gold et al. 2013. Details on suicide among US physicians: Data from the National Violent Death Reporting System. *General Hospital Psychiatry* 35(1):45–49. doi: 10.1016/j.genhosppsych.2012.08.005.

[16] Dutheil et al. 2019. Suicide among physicians and health-care workers: A systematic review and meta-analysis. *PLOS ONE* 14(12):e0226361. https://doi.org/10.1371/journal.pone.0226361.

[17] The NAM Action Collaborative on Clinician Well-Being and Resilience has the objectives of (1) raising the visibility of clinician anxiety, burnout, depression, stress, and suicide; (2) improving baseline understanding of challenges to clinician well-being; and (3) advancing evidence-based, multidisciplinary solutions to improve patient care by caring for the caregiver. Its products represent the collective opinion of the participants and do not represent recommendations from the National Academies of Sciences, Engineering, and Medicine.

[18] Dzau et al. 2020. Preventing a parallel pandemic: A national strategy to protect clinicians' well-being. *New England Journal of Medicine* 383. doi: 10.1056/NEJMp2011027.

[19] Kursumovic et al. 2020. Deaths in healthcare workers due to COVID-19: The need for robust data and analysis. *Anaesthesia* 75(8). https://doi.org/10.1111/anae.15116.

In September 2020, Nguyen et al. published a prospective observational cohort study of 2,035,395 individuals from the general community, including 99,795 HCWs, to monitor the development of COVID-19 symptoms in those two populations. HCWs were asked to report weekly on the availability of PPE and the results of any COVID-19 tests they undertook. The authors found that HCWs were three times more likely to report a positive COVID-19 test compared with the general population. Follow-up analyses suggested that risk factors for contracting COVID-19 included inadequate PPE supplies or usage, certain clinical settings (such as in-patient settings and nursing homes), and minority race/ethnicity.[20]

Two large studies have demonstrated the importance of universal masking in health care settings for reducing the risk of nosocomial acquisition of COVID-19. In one study, researchers at the Duke University Health System in North Carolina prospectively recorded COVID-19 cases among HCWs across their health system. A specialized team of contact tracers was tasked to interview affected HCWs to review potential community and occupational exposures. Based on these investigations, each case was categorized into the following sub-groups: community acquired, health care associated, or an unknown acquisition route. The study showed that 38 percent of cases were community acquired, 22 percent were health care associated, and 40 percent did not have a clear source of infection. Of the nosocomial cases, 70 percent were linked to unmasked exposure to another HCW and 30 percent were determined to be due to direct care of COVID-19 patients. The researchers also found a significant decrease in the cumulative incidence of nosocomial COVID-19 infections beginning 1 week following the implementation of universal masking in the hospital while the cumulative incidence rates in community-acquired cases did not significantly change during that time.[21]

Similar findings were reported in a study at the Massachusetts General Brigham (MGB) health care system. In March 2020, MGB implemented an infection reduction strategy involving testing of symptomatic HCWs and universal masking of health care staff and patients. Before the intervention, the positivity rate increased exponentially from 0 percent to 21.32 percent; implementation of universal masking was followed by a significantly lower rate of COVID-19 positivity among HCWs. The authors noted that the decrease in HCW infections could have been confounded by external mitigation efforts in the community. However, the case numbers continued to increase in the community during the study period, suggesting that the decrease in the COVID-19 positivity rate among HCWs was indeed associated with universal masking in the health care setting.[22]

In addition to providing physical protection to HCWs involved in the COVID-19 response, sufficient access to PPE has been shown to undergird HCW well-being. Since the start of the pandemic, multiple studies from around the world have consistently shown that access to

[20] Nguyen et al. 2020. Risk of COVID-19 among front-line health-care workers and the general community: A prospective cohort study. *The Lancet Public Health* 5(9). https://doi.org/10.1016/S2468-2667(20)30164-X.
[21] Seidelman et al. 2020. Universal masking is an effective strategy to flatten the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) healthcare worker epidemiologic curve. *Infection Control & Hospital Epidemiology* 1–2. doi: 10.1017/ice.2020.313.
[22] Wang et al. 2020. Association between universal masking in a health care system and SARS-CoV-2 positivity among health care workers. *JAMA* 324(7). doi: 10.1001/jama.2020.12897.

appropriate PPE benefits the mental health of the health care workforce, as reflected in improved job satisfaction, higher levels of readiness, increased feelings of confidence and safety, diminished fear of acquiring the infection and passing it on to loved ones, and lower overall levels distress and anxiety.[23]

These studies represent building blocks toward a national effort to better understand the scope of the burden and to identify effective strategies and interventions that support HCW well-being and safety. Universal masking and access to PPE are two examples of strategies needed to ensure the safety and well-being of the health care workforce. A comprehensive, integrated national data tracking and reporting system coupled with well-designed, focused epidemiological assessments such as those described here, could help identify more effective measures to protect the health and well-being of the health care workforce.

APPENDIX A

Previous National Academies Report Relevant to Mortality Tracking During Disasters

In September 2020, the National Academies published a report that reviewed and assessed the current state of the field and best practices in assessing and quantifying mortality and significant morbidity following large-scale disasters, which included pandemics. The report found major challenges in the collection and reporting of accurate information on disaster-related morbidity and mortality nationwide,[24] including

- substantial variation across the nation in data collection, recording, and reporting practices for disaster-related mortality and significant morbidity at state, local, tribal, and territorial (SLTT) levels;
- insufficient prioritization of current systems to ensure more accurate and consistent data collection, recording, reporting, analysis, and use on mortality and significant morbidity by stakeholders;
- poor functionality and interoperability of data systems to uniformly and effectively capture, record, and report mortality and morbidity data across multiple stakeholders; and
- a need for better training on data collection, recording, and reporting and other support for medicolegal death investigation system professionals and SLTT agencies.

A number of the findings from this report bear on the challenges with data collection and reporting during the COVID-19 pandemic, and these challenges have added complexity when considering HCW COVID-19-related mortality and morbidity. However, the potential solutions that the report identifies have clear implications for the development of a more comprehensive understanding of HCW mortality and morbidity due to COVID-19:

[23] Shreffler et al. 2020. The impact of COVID-19 on healthcare worker wellness: A scoping review. *The Western Journal of Emergency Medicine* 21(5). https://doi.org/10.5811/westjem.2020.7.48684.
[24] National Academies of Sciences, Engineering, and Medicine. 2020. *A framework for assessing mortality and morbidity after large-scale disasters*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25863.

- Adoption and use of a **uniform national framework** for collecting, recording, and reporting mortality and morbidity data;
- **Investment in improvements to data systems and tools** for collecting, recording, and reporting individual count data at a SLTT level.
- Creation of a process to develop, validate, and promulgate **national standards** for reporting on a core set of morbidity impacts, including mental well-being and psychological effects, specific to the common types of public health crises, including serious infectious disease outbreaks.

Some of these ideas are being adopted in proposed legislation. For example, in October 2020, U.S. Senators Schatz and Cassidy introduced bipartisan legislation "to create a new permanent and independent board, the National Disaster Safety Board, to study the underlying causes of disaster related fatalities and property damage nationwide."[25]

National-level solutions specific to HCWs could be extrapolated and tailored further to mitigate some of the challenges unique to pandemics, in particular to the COVID-19 crisis. For example, included in the adoption of a uniform framework for collecting, recording, and reporting HCW COVID-19 mortality and morbidity data and the promulgation of national standards for tracking and reporting mortality data could be the inclusion or flagging of specific fields in various reporting systems (including death certificates, hospital data reporting systems, and others) to track populations of interest. These could be used to track the specific professions of the deceased, other relevant demographic data, and metrics on the availability of PPE at facilities where deceased individuals worked, and whether there is evidence that the infection was acquired at work. The last is of particular importance, though it would require further investment in the development of robust contact tracing teams specifically trained to investigate HCW infections and more specifically, to determine the sources of infection (community versus work acquired). It should be noted that the challenges with this are that contact tracing of HCWs will be both different and more challenging than contact tracing in the general population (where exposures to ill patients are much less common) and would require co-reporting of infection prevention parameters (such as availability of and policies around PPE), levels of exposure, and genetic analyses of viral strains.

APPENDIX B

Authors and Reviewers of This Rapid Expert Consultation

This rapid expert consultation was prepared by staff of the National Academies of Sciences, Engineering, and Medicine, and members and outside experts on behalf of the National Academies' Standing Committee on Emerging Infectious Diseases and 21st Century Health Threats: Sue Anne Bell, University of Michigan, John Hick, University of Minnesota, and Matthew Wynia, University of Colorado

[25] Senator Schatz Press Office. 2020. Schatz, Cassidy to introduce bipartisan legislation to create new independent board to investigate major natural disasters, make policy recommendations, help save lives. https://www.schatz.senate.gov/press-releases/schatz-cassidy-to-introduce-bipartisan-legislation-to-create-new-independent-board-to-investigate-major-natural-disasters-make-policy-recommendations-help-save-lives (December 4, 2020).

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Harvey Fineberg, chair of the Standing Committee, approved this document. The following individuals served as reviewers: David Blumenthal, The Commonwealth Fund, Elaine Larson Columbia University, and Julia Bielicki, St. George's University of London, and Bobbie Berkowitz, Columbia University, and Sue Curry, The University of Iowa, served as arbiters of this review on behalf of the National Academies' Report Review Committee and their Health and Medicine Division.

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