Women on the Frontline: A Changed Workforce and the Fight Against COVID-19
Loren Galler Rabinowitz, MD, and Danielle Galler Rabinowitz, MD, MM

Abstract
COVID-19 is a worldwide pandemic, with frontlines that look drastically different than in past conflicts: women now make up 40% of health care workforce. Despite the fact that American women have a long history of helping in times of hardship, filling positions on the home front vacated by men who enlisted as soldiers during World War I and similarly serving in crucial roles on U.S. military bases, on farms, and in factories during World War II. The COVID-19 pandemic has represented a novel battleground, as the first in which women have taken center stage, not only in their roles as physicians, respiratory therapists, nurses, and the like, but also by serving in leadership positions and facilitating innovations in science, technology, and policy. Yet, the pandemic has exacerbated multiple pain points that have disproportionately impacted women in health care, including shortages in correctly sized personal protective equipment and uniforms, inadequate support for pregnant and breastfeeding providers, and challenges associated with work–life balance and obtaining childcare. While the pandemic has facilitated several positive advancements in addressing these challenges, there is still much work to be done for women to achieve equity and optimal support in their roles on the frontlines.

COVID-19: A novel battleground
In contrast to prior conflicts, the frontline of the war against COVID-19 in the United States is disproportionately composed of women, including 3 million women nurses and 1 million women doctors (Table 1). A majority of the nation’s respiratory therapists, physician assistants, occupational and physical therapists, laboratory technicians, and phlebotomists are women as well. Even in fields historically dominated by men within medicine, women are a rising force, now comprising roughly 40% of all physicians and surgeons. Additionally, in 2018, for the first time, women comprised a majority of medical school matriculants.

In addition to those in the COVID-19 trenches, women are serving in prominent government and national institutional leadership roles. Women scientists are spearheading the development of vaccine prototypes and novel antibody testing. Women hospital heads in major U.S. cities are providing publicly available updates on their respective hospital’s approaches to the pandemic to streamline efforts. Women innovators are developing personal protective equipment (PPE) through creative approaches, such as the use of 3D printing. Other women are working to ensure at-home viral testing kits for COVID-19 are more readily available to the general public.

The Changing Role of Women in Times of National Conflict
World War I, World War II, and beyond
American women have a long history of helping in times of hardship. During World War I, millions rushed to fill positions vacated by men who enlisted as soldiers. They staffed munitions factories and the Red Cross, worked family farms, and planted victory gardens on the home front. Thousands were deployed overseas as Army and Navy nurses, and many more joined the U.S. military while remaining stateside. During World War II, Rosie the Riveter’s rallying cry propelled more than 6 million American women into the workforce. While civilian and military women were crucial to the United States’ World War I and II efforts, they nevertheless remained largely out of harm’s way, predominately stationed on U.S. military bases, on farms, and in factories. Furthermore, while the ban on women serving in combat roles ended in 2013, women still accounted for only 15% of active-duty personnel as of 2015.

*Please see the end of this article for information about the authors.*

The authors have informed the journal that they agree that both L.G. Rabinowitz and D.G. Rabinowitz completed the intellectual and other work typical of the first author.

Correspondence should be addressed to Danielle Galler Rabinowitz, Department of Pediatrics, Boston Children’s Hospital, 300 Longwood Ave., Boston, MA, 02115; telephone: (617) 894-6869; email: danielle.rabinowitz@childrens.harvard.edu.

Acad Med. 2021;96:808-812.
First published online February 16, 2021
doi: 10.1097/ACM.0000000000004011
Copyright © 2021 by the Association of American Medical Colleges
Table 1
Gender Composition of Frontline Providers in Selected U.S. Conflicts and the U.S. Health Care Workforce

| U.S. conflict or workforce | Total frontline providers, no. | Women frontline providers, no. (%) |
|---------------------------|-------------------------------|-----------------------------------|
| World War I               | 4,734,991                     | 36,279 (0.8)                     |
| World War II              | 16,112,566                    | 400,000 (2.5)                    |
| Persian Gulf War          | 2,225,000                     | 155,750 (7.0)                    |
| 2019 health care workforce| 9,684,000                     | 7,301,736 (75.4)                 |

Equipment and Infrastructure: Changes to Support Women in the Health Care Workforce

PPE and uniforms

Despite impressive contributions to science, medicine, technology, and public policy from women in current and preceding decades, some institutions have been slow to institute policies that appropriately support women staff (cisgender or otherwise), including prioritizing the availability of correctly sized equipment and uniforms (e.g., ensuring sufficient supply of smaller scrub sizes).14 The pandemic has served to amplify these issues, particularly as hospitals scrambled to accommodate massive increases in patient volume during surges in cases. PPE shortages have made national headlines during this time. Yet, there was less attention paid to the fact that many women HCW require smaller-sized N95 masks and hospital scrubs, which were in even shorter supply.15 It is not just a matter of comfort, but one of safety. Wearing a mask that does not fit means that it cannot function properly, as the deflection of viral particles depends on a tight seal to the wearer’s face.16

Hospital leaders should thus be required to anticipate the needs of staff composed overwhelmingly of women by ensuring sufficient access to equipment of different sizes so as to protect all wearers equally. A renewed focus on improving the accuracy of hospital inventories by indexing N95 and scrub sizes for all employees on a regular basis would be valuable in allowing institutions and practices to assess worker needs. Universal second-line respirator fit testing would also improve PPE access in the case of first-line equipment depletion (as has occurred in many parts of the country during the COVID-19 pandemic). Finally, hospital and practice supply chains must similarly include the provision of appropriately sized gear to prevent future PPE and equipment shortages.

Accommodations for menstruating, pregnant, and breastfeeding providers

Inequities for cisgender women in medicine, in general and in the context of caring for COVID-19 patients, have extended beyond access to PPE. For example, menstruating nurses in China reported struggling to obtain access to hygiene products, making wearing full protective equipment during 12-hour shifts even more difficult.17 Additionally, finding safe, clean places in hospitals for breastfeeding individuals to pump has long been a challenge, with many often resorting to using unsanitary supply closets or bathrooms. Some HCW, newly worried about the safety of transporting pumping equipment back and forth from the hospital given the ability of COVID-19 to survive for days on plastic surfaces,18 elected to stop breastfeeding prematurely or to avoid it altogether, despite the potential health benefits to their offspring.19 These additional stressors may contribute to the already heightened rates of burnout and depression observed in women HCW, who had increased rates of both of these mental health diagnoses compared with men even before the onset of the pandemic.20,21

All medical workplaces must be required to provide dedicated, safe, and clean places for breastfeeding providers to pump and store breastmilk that are regularly maintained, with ready access to cleaning supplies for sterilization of communal and personal equipment. Furthermore, efforts should be made to minimize the risk of infection for pregnant women and parents of newborn infants. Access to hygiene products should similarly be provided to staff. Given new data about the potential increased risk for severe COVID-19 in pregnant women, it may also be reasonable to minimize exposure risk for vulnerable employees where possible.22

Work–life balance and childcare

COVID-19 has forced many Americans to rethink the integration of their work and personal life. In many ways, the struggles of women HCW—a large proportion of who have found themselves wearing even more hats than usual over the past few months, including parent, employee, teacher, barber, caretaker, housekeeper, and chef—mirror those of the broader workforce.23 Particularly in the context of cisgender, heterosexual couples, women may be taking on a disproportionate burden of household responsibilities, which, in turn, may be contributing to the nearly millions of American women who have left the workforce since the onset of the pandemic.24

Roughly 40% of physicians are married to other physicians, and many more have significant others with jobs in health care and other essential services.25 Accordingly, dual-HCW partners have consistently run the risk of being assigned to work overlapping shifts, which may also coincide with other mandatory obligations, such as facilitating long-distance learning for children at home. Availability of childcare coverage, not to mention concerns about the safety of bringing an additional person into one’s home during a period of social distancing, has caused overwhelming anxiety for many HCW parents.

Moreover, variability in sick leave policies, as well as fears about what should happen if both partners were to become infected with COVID-19, has prompted updates to wills and careful designation of health care proxies.26 A lack of pay equity among physicians (with a persistent gender wage gap nationally—this gap was 27.7% in 2017 and 25.2% in 201827) has also led some women physicians, particularly those who are cisgender and in heterosexual relationships with traditional gender roles, to consider whether they should step away from their jobs and careers to provide adequate childcare and household support. Similar considerations have been documented among nurses28,29; these considerations reflect long-standing trends in gendered labor division within the home.10 This
mindset is particularly concerning at a time when the United States is facing a critical shortage of skilled medical staff and risks further decreasing the numbers of women in academic medicine and leadership roles. According to a recent report from the U.S. Bureau of Labor Statistics, women have left jobs at 4 times the rate of men since the start of the pandemic. In September 2020 alone, 865,000 women dropped out of the labor force. If forced to choose between career and personal or family safety, women may reasonably elect to leave the health care workforce, thus further undermining the national response to the pandemic.

By increasing access to and affordability of childcare options, HCW with families will be better able to serve at the bedside. Increased shift flexibility, adoption of telemedicine, and deployment strategies that account for single-parent and dual-HCW families will similarly support physicians, who have selflessly stepped into both familiar and new roles as COVID-19 cases have mounted.

### Crisis and Opportunity
Crisis often spurs ingenuity. If past months of the pandemic have proven anything, it is that the health care system is capable of rapid, large-scale advancements under pressure. In a short span of time, field hospitals were built in metropolitan green spaces and health care systems doubled their bed capacity seemingly overnight. Labs were repurposed to investigate COVID-19, allowing for more scientists to study new treatments and preventive strategies. Specialists and subspecialists were deployed to COVID wards, intensive care units, and emergency rooms to scale care while maximizing patient safety. Physicians designed new equipment to protect themselves while intubating critically ill patients and brainstormed ways to stretch a limited supply of ventilators. If all of these initiatives were achievable, innovations specific to women on the frontlines also ought to be feasible to protect both their safety and ability to remain focused on the task at hand—fighting this pandemic.

Many health systems have been proactive in accommodating women providers as COVID-19 has ripped through their systems.

---

### Table 2
**Challenges With Disproportionate Impact on Women HCW: Implications of the COVID-19 Pandemic and Next Steps**

| Challenges for women HCW | Implications of the COVID-19 pandemic | Next steps |
|--------------------------|--------------------------------------|------------|
| Availability of correctly sized equipment and uniforms (i.e., PPE, scrubs) | • Identification of shortages  
  • Increased infection and mortality risk for frontline HCW | • Improve accuracy of hospital inventories and needs by indexing N95 and scrub sizes for all employees  
  • Improve hospital and practice supply chains to minimize and prevent future PPE and equipment shortages  
  • Require universal second-line respirator fit testing to ensure adequate PPE access in case of first-line equipment depletion |
| Accommodations for pregnant and other high-risk (e.g., > 65 years, immunocompromised, parents of infants, immunocompromised family members) providers | • Recognition of variable infection and mortality risk among frontline HCW  
  • Increased mortality rates among older HCW  
  • Increased use of and access to telemedicine for pregnant and other high-risk providers | • Increase availability of telemedicine for clinical care among pregnant and other high-risk providers where appropriate  
  • Streamline and formalize approach to hospital deployment policies, with attention toward reducing exposure risk for pregnant and other high-risk providers  
  • Consider redeployment of pregnant and other high-risk HCW to lower-risk inpatient and outpatient settings |
| Accommodations for breastfeeding providers | • Longer and more frequent shifts  
  • Increased difficulty in finding clean and available dedicated spaces for pumping and storing breastmilk  
  • Use of communal equipment less desirable given infection risk | • Require dedicated in-hospital or in-office space for pumping and storing breastmilk, which should be maintained frequently for sanitation purposes  
  • Ensure access to high-grade cleaning supplies to minimize surface-driven transmission risks  
  • Use hospital deployment strategies to minimize exposure risks for breastfeeding providers, as above |
| Childcare options | • Lack of access to safe, affordable, and reliable childcare options during pandemic  
  • Switch to distance or online learning requires parental facilitation and supervision in many cases | • Further develop app platforms to aid access to childcare options  
  • Provide enhanced childcare subsidies  
  • Allow work shift flexibility, increase availability of telemedicine for clinical care, and improve sick leave policies, particularly for single-parent HCW  
  • Consider dependency furloughs in extenuating circumstances  
  • Use deployment strategies that better take into account single-parent and dual-HCW families (e.g., avoid overlapping shifts where possible) |
| Increased visibility in leadership | • Fewer women in leadership or decision-making roles than before the COVID-19 outbreak  
  • Slow acknowledgment of and response to challenges specific to or with increased impact on women HCW | • Make a formal commitment by practices, institutional and medical school leadership, and medical journals to increase representation and promotion of women |
| Pay equity | • Persistent pay gap between men and women physicians pre-COVID-19 (27.7% in 2017 and 25.2% in 2018) | • Formalize policies around pay equity  
  • Make a formal commitment to not inquiring about prior compensation when hiring |

Abbreviations: HCW, health care workers; PPE, personal protective equipment.
exist in medicine and other fields to optimize working conditions and support for women HCW and their families.

Women are deeply proud to be serving on this frontline. They should be sent into battle with the knowledge that their loved ones are and will be cared for and that they are optimally equipped to deliver the best care possible to their patients.

Acknowledgments: The authors wish to thank Janina R. Galler, MD, serving as their role model in academic medicine and for inspiring and encouraging them to become physicians and to write this piece.

Funding/Support: None reported.

Other disclosures: None reported.

Ethical approval: Reported as not applicable.

L.G. Rabinowitz is a fellow, Department of Gastroenterology, Kahn School of Medicine at Mount Sinai, New York, New York; ORCID: http://orcid.org/0000-0002-6673-4096.

D.G. Rabinowitz is resident physician, Boston Combined Residency Program, Boston Children's Hospital and Boston Medical Center, Harvard Medical School, Boston, Massachusetts; ORCID: https://orcid.org/0000-0002-5437-5719.

References
1. U.S. Bureau of Labor Statistics. Labor force statistics from the current population survey—Household data. https://www.bls.gov/cps/cpsaat11.htm. Updated January 22, 2020. Accessed May 10, 2020.
2. Joiner MA, Weiner CM. Employment of women in war production. Soc Sec Bull. July 1942;4:15. https://www.ssa.gov/policy/docs/sab/v5n7/v5n7p1.pdf. Accessed January 29, 2021.
3. Harvey S. Rosie the Riveter: Real women workers in World War II [transcript]. The Library of Congress. https://www.loc.gov/rr/program/journey/robbie-transcript.html. Published July 20, 2010. Accessed January 29, 2021.
4. Bumiller E, Shanker T. Pentagon is set to lift combat ban for women. The New York Times. https://www.nytimes.com/2013/01/24/us/penptom-exays-it-is-lifting-ban-on-women-in-combat.html. Published January 22, 2013. Accessed January 29, 2021.
5. Time Labs. See women's progress in the U.S. Military. https://labs.time.com/story/women-in-military. Published September 8, 2015. Accessed January 29, 2021.
6. Association of American Medical Colleges. 2019 Facts: Applicants and Matriculants Data. https://www.aamc.org/data-reports/students-residents/interactive-data/2019-facts-applicants-and-matriculants-data. Published December 9, 2019. Accessed May 10, 2020.
7. U.S. Department of State. Biography—Deborah L. Birx, MD. https://www.state.gov/biographies/deborah-l-birx-md. Updated April 4, 2014. Accessed August 27, 2020. [No longer available.]
8. Akst J. COVID-19 vaccine frontrunners. The Scientist. https://www.thescientist.com/news-opinion/COVID-19-vaccine-frontrunners-67382. Published April 7, 2020. Accessed January 29, 2021.
9. Stadlbauer D, Amanat F, Chronokova V, et al. SARS-CoV-2 seroconversion in humans: A detailed protocol for a serological assay, antigen production, and test setup. Curr Protoc Microbiol. 2020;57:e100.
10. New York-Presbyterian. Leadership update on novel coronavirus (COVID-19). https://video.ibm.com/channel/nwaBPuv2vkh. Accessed January 29, 2021.
11. Walsh K, Sahni N. Adapting healthcare to COVID-19: An interview with the CEO of Boston Medical Center. McKinsey & Company. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/adapting-healthcare-to-COVID-19-an-interview-with-the-ceo-of-boston-medical-center. Published May 26, 2020. Accessed January 29, 2021.
12. Strusnsky S. Grassroots effort to 3D print masks to fight coronavirus is starting in a tiny N.J. shop. True Jersey. https://www.nj.com/coronavirus/2020/03/a-hi-tech-way-to-fight-the-coronavirus-hit-print.html. Published March 20, 2020. Accessed January 29, 2021.
13. Everwellly. https://www.everwellly.com. Accessed May 9, 2021.
14. Rabinowitz LG, Anandasabapathy S, Sethi A, Siddiqui UD, Wallace MB, Kim MK. Addressing gender in gastroenterology: Opportunities for change. Gastroint Endosc. 2020;91:135–161.
15. Pugh R. COVID-19 PPE gender divide: No one-size-fits-all. Medscape. https://www.medscape.com/viewarticle/929860. Published May 4, 2020. Accessed January 29, 2021.
16. Asadi S, Cappa CD, Barreda S, Wexler AS, Bouvier NM, Ristenpart WD. Efficacy of masks and face coverings in containing outward aerosol particle emission from expiratory activities. Sci Rep. 2020;10:15665.
17. Stevenson A. Shaved heads, adult diapers: Life as a nurse in the coronavirus outbreak. The New York Times. https://www.nytimes.com/2020/02/26/business/coronavirus-china-nurse-menstruation.html. Published February 26, 2020. Accessed January 29, 2021.
18. Van Doremalen N, Morris DH, Holbrook MG, et al. Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1. New Engl J Med. 2020;382:1564–1567.
19. Brusie C. Nurses share tips to breastfeed & pump while working during COVID-19. Nurse.org. https://nurse.org/articles/breastfeeding-and-pumping-COVID-19-nurse. Published April 17, 2020. Accessed January 29, 2021.
20. Templeton K, Bernstein CA, Sukhera J, et al. Gender-based differences in burnout: Issues faced by women physicians. Paper presented at: National Academy of Medicine Conference; May 30, 2019; Washington, DC. https://nam.edu/gender-based-differences-in-burnout-issues-faced-by-women-physicians. Accessed January 29, 2021.
21. Legassie J, Zibrowski EM, Goldszmidt MA. Measuring resident well-being: Impostorism and burnout syndrome in residency. J Gen Intern Med. 2008;23:1090–1094.
Gupta AH. Why did hundreds of thousands of women drop out of the workforce? The New York Times. https://www.nytimes.com/2020/03/03/parenting/childcare-coronavirus-moms.html. Published March 20, 2020. Accessed January 29, 2021.

Bennett J. ‘I feel like I have five jobs’: Moms navigate the pandemic. The New York Times. https://www.nytimes.com/2020/03/03/pregnancy-breastfeeding.html. Updated December 28, 2020. Accessed February 9, 2021.

Kiersz A. 6 Maps that show how far doctors have to close the gender pay gap. Business Insider. https://www.businessinsider.com/maps-that-show-the-gender-pay-gap-in-medicine-2019-4. Published April 2, 2019. Accessed January 29, 2021.

Ali SS. Why some nurses have quit during the coronavirus pandemic. NBC News. https://www.nbcnews.com/news/us-news/why-some-nurses-have-quit-during-coronavirus-pandemic-n1201796. Published May 10, 2020. Accessed January 29, 2021.

Bianchi SM, Sayer LC, Milkie MA, Robinson JP. Housework: Who did, does or will do it, and how much does it matter? Soc Forces. 2012;91:55–63.

Frieden J. COVID-19 is making the physician shortage worse, group says. MedPage Today. https://www.medpagetoday.com/infectiousdisease/COVID19/85661. Published March 27, 2020. Accessed January 29, 2021.

U.S. Bureau of Labor Statistics. Employment Situation Summary. https://www.bls.gov/news.release/empsit.nr0.htm. Accessed February 5, 2021.

Mount Sinai. Samaritan’s Purse, in collaboration with Mount Sinai Health System, opens emergency field hospital in New York’s Central Park in response to the coronavirus pandemic. https://www.mountsinai.org/about/newsroom/2020/samaritans-purse-in-collaboration-with-mount-sinai-health-system-opens-emergency-field-hospital-in-new-york’s-central-park-in-response-to-the-coronavirus-pandemic-pr. Published April 1, 2020. Accessed January 29, 2021.

Kim MK, Rabinowitz LG, Nagula SN, et al. A primer for clinician deployment to the medicine floors from an epicenter of COVID-19. NEJM Catalyst Innovations in Care Delivery. https://catalyst.nejm.org/full/10.1056/CAT.20.0180. Published March 23, 2020. Accessed January 29, 2021.

Farkas J. PulmCrit—Splitting ventilators to provide titrated support to a large group of patients. EMCrit. https://emcrit.org/pulmcrit/split-ventilators. Published March 15, 2020. Accessed January 29, 2021.

Mount Sinai. HR information. https://www.mountsinai.org/about/COVID19/staff-resources/faqs. Accessed January 29, 2021.

Military Onesource. How to create a family care plan for caregivers. https://www.militaryonesource.mil/military-life-cycle/employment/creating-a-family-care-plan. Published February 20, 2020. Accessed January 29, 2021.

Janove J. More jurisdictions are banning military service—History inquiries, Society for Human Resource Management. https://www.shrm.org/resourcesandtools/legal-and-compliance/state-and-local-updates/pages/more-jurisdictions-are-banning-salary-history-inquiries.aspx. Published April 4, 2019. Accessed January 29, 2021.

References cited only in tables

Congressional Research Service. American war and military operations casualties: Lists and statistics. https://fas.org/sgp/crs/natsec/RL32492.pdf. Updated July 29, 2020. Accessed January 29, 2021.