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## Nursing Science and COVID-19

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Nurse scientists have undertaken important work related to minimizing the spread of COVID-19, studying the care of persons who contracted the virus, and examining the differential effects of the virus across various populations. They have also participated in developing and raising awareness of resources to guide research and data collection about the pandemic, including the National Library of Medicine COVID-19 resource site (<https://www.ncbi.nlm.nih.gov/sars-cov-2/>) and the COVID-19 protocols of the PhenX Toolkit (<https://www.phenxtoolkit.org/covid19/>).

However, we know of no concerted effort to identify areas where the work of nurse scientists may have the greatest effects. In this commentary, the members of the CANS Science Committee propose the CANS research priorities as a framework for nurse scientists' research pertaining to COVID-19: big data, global health, health determinants, and precision science (Eckardt et al., 2017). Use of these priorities can serve to organize the nurse scientists' community response to the COVID-19 pandemic.

### Big Data

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Nurse scientists know that the application of big data analytics to real-world clinical phenomena requires careful analysis and interpretation. Big data helps us understand the spread and depth of the pandemic, allowing us to know if containment and mitigation efforts are, in fact, "flattening the curve" (Lewnard & Lo, 2020), and to weigh the balance of efforts against economic and other unintended consequences (Nicola et al., 2020). These same data help us know when to advance reopening or prepare hospitals for a surge of severe cases (Carenzo et al., 2020). The COVID-19 pandemic has put a public spotlight on the work of tracking sites (see for example <https://coronavirus.jhu.edu/> and <https://covid19.healthdata.org/united-states-of-america>). However, the predictive models from epidemiologic data are varied and sometimes conflicting.

Moreover, data collected during the first months of the pandemic were massive (Unwin et al., 2020).

Just as Florence Nightingale used data to track the spread of disease at Scutari, tracking and monitoring disease activity and patient symptoms is important to understanding patterns in the diseases. Today, complex analyses of contact tracing, often using artificial intelligence and machine learning techniques, can enable initiation of appropriate isolation and quarantine measures (Li et al., 2020). Additionally, smartphone GPS history data allows better tracing. Use of digital technologies for public health surveillance will require balance with policies to protect against ethical and privacy issues (Ferretti et al., 2020; Wang et al., 2020). Nurse scientists can contribute to big data approaches to COVID-19 by providing a nursing perspective in their collaborations with colleagues in informatics, epidemiology, infectious disease, and other disciplines to develop and implement safe, effective, and ethical tracking and tracing systems.

### Global Health

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The global health effects of COVID-19 will not be fully understood for some time. However, we should expect that in particularly health resource-poor nations, the pandemic effects will be more catastrophic than in the United States (U.S.). Many U.S.-based nurse scientists have global connections, affording the opportunity to extend research expertise to colleagues worldwide. Nurse scientists can collaborate to study how various regions managed COVID-19 and its long-term effects on health and well-being. Nurse scientists can also participate in studies to prevent future outbreaks of COVID-19 and other infectious diseases. Moreover, because the virus has affected persons worldwide, nurse scientists have the opportunity to conduct secondary analyses on data from multiple countries, particularly with a focus on culture, psychological distress, and social determinants of health (Chen et al., 2020). Nurse scientists are particularly well-versed in the

study of human stress responses to adverse events; the COVID-19 pandemic offers an opportunity for global exploration of these responses.

## Health Determinants

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The COVID-19 pandemic has raised awareness of determinants of health and their effect on health disparities and inequities, areas of research foci of particular interest to nurse scientists. COVID-19 disproportionately affects Hispanic, Black, and American Indian/Alaskan Native populations (Stokes et al., 2020). The devastating economic effects of the pandemic also disproportionately affects Black, Hispanic/Latino, and low-income people (Greene & McCargo, 2020; Lopez et al., 2020; Spievack et al., 2020). Moreover, many rural communities are vulnerable and ill-equipped to handle the pandemic due to limited healthcare access and a population proportionately older and in worse health relative to urban residents (Bolin et al., 2015; O'Connor & Wellenius, 2012; Smith & Trevelyan, 2019; Trivedi et al., 2013).

COVID has also highlighted the effect of age on health. Although older adults have been at greater risk for contracting COVID-19 and experiencing significant health complications, the need to quarantine at home and the resulting emotional and economic stress for families has resulted in significant effects on children including increased safety concerns and decreased general healthcare such as immunizations (Bramer et al., 2020; Green, 2020). The long-term effect of COVID-19 on the mental health of children is particularly concerning (Courtney et al., 2020; Fegert et al., 2020) and will require nurse scientists to monitor and develop interventions for at-risk children.

## Precision Science

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Precision science is the individual variability in personal and environmental characteristics inclusive of lifestyle, co-morbidities and biomarkers, cognitive and emotional factors, as well as genetic, epigenetic and other omic underpinnings (Eckardt et al., 2017). Targeted prevention and treatment interventions developed from the perspective of precision science consider these factors in order to predict disease occurrence and progression as well as symptom susceptibility (Eckardt et al., 2017). In the current pandemic, older adults and those with certain chronic health conditions have experienced the greatest morbidity and at times the highest mortality rates (Wu & McGoogan, 2020). The comprehensive perspective of precision science can guide development and testing of interventions for these particularly complex populations to determine the greatest effects on patient reported outcomes including quality of life. Many

nurse scientists are fully engaged in precision science. Their work can help us move to more focused prevention and treatment interventions that are effective at reducing physical and mental health risks for those most susceptible to COVID-19.

## Other Considerations

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### Care Delivery Science

Nurse scientists can be at the forefront of research on health care delivery strategies that saw rapid uptake in wake of the pandemic. For example, there has been substantial interest in the use of telehealth during the pandemic (Maese et al., 2020), yet scholars note that certain high-risk communities lack access to broadband internet needed for some telehealth services (Graves et al., 2020). Nurse scientists are well-positioned to study the conditions under which telehealth is most likely to be effective and well received. Current evidence suggests certain patient populations support using telehealth during the pandemic, yet most would prefer in-person visits once the pandemic subsides (Sorensen et al., 2020). Further, preferences for in-person visits rise with increased medical complexity. These findings underscore the importance of further research on how innovative treatment modalities might be best used for routine patient care as well as for care during a time of crisis.

### Implementation Science

The rapid evolution of scientific discoveries about COVID-19 from many disciplines requires the use of implementation science to reduce the research-to-practice gap and translate what we know to what we do (Eccles & Mittman, 2006). Implementation science facilitates the adoption of evidence-based practice and research into regular use by practitioners and policy-makers and can be used to address critical issues such as improving vaccine uptake when one is available, applying infection control procedures, and addressing barriers to the use of prone positioning for patients with COVID-19 (Elharrar et al., 2020). The use of implementation science techniques will help nurse scientists examine and modify policies and practices that may have contributed to the health system's and public's lack of preparedness for the pandemic. In particular, nurse scientists can contribute by studying institutional barriers to effective care delivery, testing organizational interventions, and rapidly disseminating information about the most effective and sustainable interventions (Talsma et al., 2008).

### Doing Good Science

There has been much research reported about COVID-19, some without peer review. A number of research

reports have already been retracted (<https://retractionwatch.com/retracted-coronavirus-covid-19-papers/>). Replicability in scientific inquiry is critical for establishing new knowledge and gaining confidence over time in our research findings (National Academies of Sciences, Engineering, and Medicine, 2019). Comparing, contrasting, and synthesizing results across studies addresses the replicability necessary to advance nursing science. Nursing research has changed dramatically over the past few months. Studies were interrupted and restarted with additional safeguards to minimize the risks of COVID-19 transmission. Non-essential clinical trials requiring in-person contact were halted, resulting in missed interventions and outcome assessments. Behavioral interventional studies were modified for remote rather than in-person delivery. Although these changes were necessary, the historical effects of COVID-19 introduce an additional level of complexity that will need to be considered when interpreting study findings conducted during the pandemic.

## Conclusion

COVID-19 will be with us for the foreseeable future; some epidemiologists are now calling it endemic rather than pandemic (Denworth, 2020). If indeed the virus is or becomes endemic, that may change our scientific priorities. Regardless, we are certain the work of nurse scientists can make a difference in both the near and distant future.

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