EDITORIAL

SARS-CoV-2 in the U.S. Military — Lessons for Civil Society

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Barr and Podolsky recently commented in the *Journal*[1] on the long-term influence that military medicine has historically had on medical practice in civil society. They specifically note how the accelerated medical advances made by the military were adopted in civilian sectors during and after World War II, which they discuss in the context of the coronavirus disease 2019 (Covid-19) pandemic. The Department of Health and Human Services and the Department of Defense are using a framework to efficiently develop, test, and implement medical solutions to prevent, detect, and treat severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Two articles now published in the *Journal* (online November 11)[2,3] speak to this historical dialogue — they show how medical practices used in the military could inform civilian public health practices with respect to shared living situations during the Covid-19 pandemic.

Kasper and colleagues[2] describe a SARS-CoV-2 outbreak that occurred at sea on the U.S.S. *Theodore Roosevelt*, a nuclear-powered aircraft carrier with a crew of 4779 mostly young, healthy personnel. Molecular diagnostics performed on board to detect SARS-CoV-2 allowed Navy medical personnel to diagnose infections and begin to take nonpharmaceutical measures to reduce spread. After the outbreak was identified, the ship made port at a U.S. Navy facility in Guam, where a comprehensive response to the outbreak was implemented and an epidemiologic investigation was conducted. A total of 1271 crew members were ultimately found to have SARS-CoV-2 infection; 77% showed no signs of disease at the time of the initial diagnosis, and 55% did not have symptoms develop at any time. There were few hospitalizations and deaths (23 crew members were hospitalized, 4 were admitted to an intensive care unit, and 1 died), as would be expected given the relative youth of a warship's population. Infection was associated with work in confined spaces and enlisted rank (most likely a result of close-quarters living conditions). A higher burden of disease was also associated with coexisting conditions. These findings support the observation that young, healthy persons can contribute to community spread of infection, often silently.

Letizia and colleagues[3] examine the effect of a phased quarantine of 1848 recruits reporting to Marine Corps Recruit Depot, Parris Island, South Carolina. Recruits completed a 2-week self-quarantine period at home, followed by a 2-week supervised quarantine on a college campus after assignment to platoons, which consisted of 50 to 60 recruits. A total of 16 recruits tested positive for SARS-CoV-2 within 2 days after arrival at the quarantine campus, 15 of whom were asymptomatic; 24 subsequently tested positive on day 7, and 11 tested positive on day 14. Of the 51 recruits who tested positive on any day, 5 reported having symptoms within the 7 days before a positive result. The results of molecular phylogenetic analysis of viral isolates were consistent with transmission within platoons. The results of this study show that the ability of screening procedures to detect infection before and after quarantine needs to be strengthened, especially considering that the supervised quarantine location in this study was a college campus and not a highly secured military installation. The occurrence of late infections during the supervised quarantine shows that this quarantine should most likely have been longer than 2 weeks. An extended quarantine may prevent further transmission once recruits enter a prolonged training period on base, where physical distancing is far more difficult to reconcile with the need to train combat infantry. As with the study on the U.S.S. *Theodore Roosevelt*, the use of more advanced molecular virologic and serologic testing and the correlation of findings to clinical outcomes with respect to transmission and disease are warranted. These procedures are now being used in shared living environments, in both operational and training settings, in all U.S. military services.

The U.S. military must continue operations and training during a pandemic. For the Navy, contact among persons can be controlled only to a limited extent once a ship is underway because of close-quarters living conditions on warships. Thus, procedures include strict predeployment quarantine of crew members, isolation of infected persons after a ship has left port, highly restricted shore leave, increased hygiene measures in common areas, and continual risk assessment. The ability to diagnose and manage SARS-CoV-2 infection on board will need to be enhanced with more sensitive and specific diagnostics to assess infectivity, including newer molecular approaches such as subgenomic RNA analysis[4] and serologic testing.

Military operations and training must be informed by newer epidemiologic studies that provide clinicopathological correlation between increasingly advanced molecular and serologic testing and prediction of clinical outcomes, especially given the current uncertainty regarding the prognostic value of serologic testing[5] and the evolving understanding of virologic and molecular biologic testing.[6] Such knowledge could be relevant to commercial and recreational seagoing operations.[7] The approaches learned from the U.S.S. *Theodore Roosevelt* and Parris Island can be applied, with varying degrees of relevance, to land-based shared living situations such as college dormitories, prisons, and residential care facilities, as well as sports training environments, meat-processing facilities, and isolated energy plants. Additional studies are needed to understand the durability of natural immunity and the durability of immunity from vaccination or passive immunotherapy, when data are available. The addition of these pharmaceutical interventions to the available public health tools will help control the pandemic and safely open societies. Only the scientific analysis of the epidemiology of infection in such shared living environments with these new diagnostic, preventive, and therapeutic interventions will allow for sound policy decisions in the response to the Covid-19 pandemic as well as subsequent pandemics of respiratory viruses to come.

The views expressed are those of the author and should not be construed to represent the positions of the U.S. Army or the Department of Defense.

Disclosure forms provided by the author are available with the full text of this editorial at NEJM.org.

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