COVID-19 Contact Tracing in an Overseas U.S. Military Population

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ABSTRACT The purpose of this study was to describe the early epidemiology and contact tracing challenges for COVID-19 infection in an overseas military and DoD population.

From February 28, 2020 to April 27, 2020, patients who were diagnosed with Covid-19 infection completed a Centers for Disease Control Persons Under Investigation (PUI) form during their encounter with a medical provider. Positive results were forwarded to the Public Health Department. The results of the contact tracing and PUI form were entered into a database and analyzed.

Eight Covid-19 cases were diagnosed in this overseas population. Based on beneficiary population, the cumulative incidence was ~80/100,000 persons. The age distribution ranged from 25 to 60 years, median 36 years. Most patients were male (75%). More infection occurred in those living off base in the community (87.5%). With the capability of on-site testing at the hospital, the median duration from symptom onset to diagnosis improved from 5 days to 1 day.

Disease contact tracing for DoD populations presents unique considerations in an overseas location. Public Health guidelines for the USA may have varying relevance in an overseas location. Rapid case identification with on-site testing is critical to disrupt disease transmission. Preventive measures for Covid-19 infection have decreased incidence of influenza-like illness.

In early December 2019, the first pneumonia cases of a novel coronavirus were identified in Wuhan, China. The pathogen has been subsequently identified as an RNA coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2). The World Health Organization later named the resulting infection COVID-19.

After only a few months, COVID-19 infection rapidly spread across the world, causing numerous outbreaks in multiple populations to include long-term care facilities, businesses, and communities. On March 11, 2020, the World Health Organization declared a pandemic.

The military is a unique community with an essential mission. This report describes the epidemiology and contact tracing of the first Navy cases diagnosed at a U.S. military hospital system located overseas.

CASE REPORT

On February 26, 2020, a 32-year old male complained of subjective fever, chills, myalgias, malaise, and productive cough. He described mild sharp diffuse chest pains associated with a slight shortness of breath. Presenting for care on 28 February, he had a temperature of 99.4°F, a pulse rate of 87, respiratory rate of 16, and room air pulse oximetry of 95%. A rapid flu test was negative. A respiratory viral pathogen panel was sent to another medical facility and was negative. A chest radiograph showed “patchy opacities” in the right lower lobe without pleural effusion or pneumothorax. He was prescribed azithromycin, codeine/guaifenesin liquid, and acetaminophen.

The patient’s history was significant for travel to a location 2 weeks earlier deemed to be a COVID-19 international “hotspot.”

One week after his clinical visit, on March 6, 2020, the results of his respiratory panel were positive for COVID-19. The patient was informed of these results and he reported resolution of his symptoms. For return to work criteria, a laboratory-based strategy was employed with two negative test results separated by 24 hours.

He was returned to work on March 23, 2020 after two negative tests. Interestingly, he had a negative Polymerase Chain Reaction (PCR) result on 11 March, inconclusive result on 12 March, a positive result on 17 March, and second negative result on 23 March.

The military Public Health Department, upon notification of COVID-19 diagnosis, immediately began a contact investigation on 6 March. The investigation team aggressively traced contacts 14 days before the patient’s symptom onset because the reported incubation period was 14 days and the U.S. CDC contact tracing guidance was not yet published. The initial investigation identified a total of 66 contacts categorized based on their exposure history: high (close personal contact), medium (within 6 feet for over 10 minutes), and low (not within 6 feet and less than 10 minutes). Contacts were prioritized as two high-risk international contacts, 40 medium-risk contacts, and 24 low-risk contacts. Forty-six (70%) contacts were affiliated with the DoD, 14 (21%) were local nationals, and six (9%) were international contacts. Ultimately, the results of the investigation yielded one additional case in a co-worker.
From 28 February to April 27, 2020, the hospital diagnosed six additional COVID-19 cases in this overseas military population. Results are summarized in Table I.

### METHODS

The overseas military hospital provides comprehensive health care for the military community to include active duty, family members, and government service employees. Initially, patients suspected of COVID-19 infection had nasopharyngeal samples sent to either the partner nation public health laboratory or mailed to a tertiary military medical center ~1,400 km away. On 2 April, the military hospital obtained Polymerase Chain Reaction capability locally.

Patients who were diagnosed with COVID-19 infection completed a CDC Person under Investigation (PUI) form during their clinical encounter with a medical provider. Positive results were forwarded to the hospital’s Public Health Department for case contact tracing where the patient was interviewed over the phone. The patient completed an extensive phone interview and was contacted daily for welfare checks, needs assessment, and appraisal of return to work criteria. Results from the CDC PUI forms and telephone interviews were collected and entered into a database (Table I).

### RESULTS

From February 28 to April 27, 2020, eight COVID-19 cases were diagnosed by the military hospital. Based on the beneficiary population, the cumulative incidence was ~80/100,000 persons.

During this period, the military overseas hospital laboratory COVID positivity rate was 9.5%. Data from the CDC COVID View Week 12 (April 18, 2020) for the U.S. population showed a positivity rate of 9.6%.

The age distribution of cases ranged from 25 to 60 years, median 36 years, which reflects the relatively younger population of the military community. Most patients were male (75%). Officers and enlisted personnel were equally infected (37.5%). More infection occurred in those living off base in the community (87.5%). A relatively healthy population, 1 (12.5%) person had pre-existing conditions and no patients required inpatient care.

Most cases had non-specific symptoms of acute respiratory infection to include fever (62.5%), chills (50%), muscle aches (50%), and cough (62.5%). Three patients (37.5%) reported travel outside the local community. From February 26 to April 21, 2020, the median duration from symptom onset to diagnosis was 5 days. However, after 2 April when the hospital acquired local capability to test, the median time from symptom onset to diagnosis was 1 day (Fig. 1).

### DISCUSSION

In a small overseas military community, patient privacy is very difficult to maintain at times. Because of the interrelated working environment, close contacts had strong suspicions of the identity of positive cases—especially the first case. Health care professionals and military leaders should strive to protect patient privacy which ultimately prevents stigma of positive patients and encourages sick personnel to present for evaluation and prompt case identification.

In our overseas military community, the cumulative incidence rate of infection was 80/100,000, which was initially

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**TABLE I.**

| Characteristic                              | n = 8 |
|---------------------------------------------|-------|
| Median Age (range)—years                   | 36 (25-60) |
| Distribution—number (%)                    |       |
| 0-17 years                                  | 0 (0) |
| 18-39 years                                 | 5 (62.5) |
| 40-49 years                                 | 2 (25) |
| 50–60 years                                 | 1 (12.5) |
| Sex                                         |       |
| Female                                      | 2 (25) |
| Male                                        | 6 (75) |
| Occupation                                  |       |
| Active duty                                 |       |
| Enlisted                                    | 3 (37.5) |
| Officer                                     | 3 (37.5) |
| Family member                               | 2 (25) |
| Living quarters                             |       |
| On base                                     | 1 (12.5) |
| Off base                                    | 7 (87.5) |
| Smoking/vaping history                      |       |
| Yes                                         | 1 (12.5) |
| No                                          | 7 (87.5) |
| Body mass index                             |       |
| Normal (<25)                                | 3 (37.5) |
| Overweight (≥25)                            | 5 (62.5) |
| Race                                        |       |
| White                                       | 6 (75) |
| Black                                       | 1 (12.5) |
| Asian                                       | 1 (12.5) |
| Pre-existing health condition                |       |
| None                                        | 7 (87.5) |
| Cardiac                                     | 1 (12.5) |
| Symptoms                                    |       |
| Fever                                       | 5 (62.5) |
| Chills                                      | 4 (50) |
| Myalgia                                     | 4 (50) |
| Nasal congestion                            | 4 (50) |
| Sore throat                                 | 2 (25) |
| Cough                                       | 5 (62.5) |
| Shortness of breath                         | 2 (25) |
| Headache                                    | 5 (62.5) |
| Nausea/vomiting                             | 1 (12.5) |
| Olfactory taste disorder                    | 1 (12.5) |
| Chest pain                                  | 1 (12.5) |
| Abnormal chest radiograph                   | 1 (12.5) |
| Travel outside military community            | 3 (37.5) |
| Median Time from onset of symptoms—(range)  | 5 (0-14) |

*One active duty officer was also a health care worker.*
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Similar to the cumulative incidence rate in the local overseas region of 86.6/100,000, the CDC reported a widely varied cumulative incidence rate (from 20.6 to 915.3 cases per 100,000) in the USA. In the CDC report, geographic differences in incidence rate were attributed to increasing infection rates, testing capability, population density, and disease reporting. Testing capability and population density also varies significantly across military populations. Our population was not very densely populated, and most workers were able to successfully implement physical distancing practices.

No cases were hospitalized, likely reflecting the “healthy worker effect” and the military’s younger and healthier population. Additionally, active forces and families living overseas are medically screened to ensure that adequate medical services are available. Although COVID-19 infection was initially reported to infect males more than females, the higher rate of infection in our case series likely reflects that males generally represent 80% of the armed forces.

The greatest risk of infection to military personnel was to those living off base. The military population was a subset of the local population: sharing grocery stores, community functions, and entertainment and sporting events. Current strategies to prevent infection in operational forces are to quarantine personnel away from the community before mission execution and test to ensure a ready force. Military leaders must continue to balance the impacts of the isolation “bubble” of military personnel separated from their communities with critical mission requirements until more definitive treatments or preventive interventions, like vaccination, are fully implemented.

The COVID-19 positivity rate of 9.5%, at this facility, was on par with most clinical laboratories. The capability to test locally dramatically decreased the median time of diagnosis from symptom onset from 5 days to 1 day. With rapid identification, supportive, and preventive measures were implemented more efficiently and contact investigations were started sooner, potentially resulting in the decreased spread of infection.

Officers and enlisted were equally infected (37.5%) which is unusual as the military generally has more enlisted (80%), than officers. This finding may be because more officers live off base where the greatest risk of transmission was noted.

Public Health investigations require collaboration among many stakeholders. Transparency with global public health partners is imperative to ensure professional collaboration and mitigate the spread of infection. In one of our cases, close contacts were identified in six countries requiring five embassies outside the partner nation to be notified.

Additionally, U.S. policies may not always align with those of partner nations, presenting unique challenges. For example, U.S. return to work guidance differed with those of our global partner nation. Military leaders had to report positive cases to facilitate contact investigations while balancing military priorities with partner nation’s policies to foster mutual respect, maintain robust rapport with global partners, and collaboratively mitigate the spread of infection. Although military operational security and mission readiness are paramount, cooperation with global public health partners is essential for the sustainment of mutually beneficial relationships.

Quarantine (those that may have been exposed) and isolation (those that were sick) of critical workers potentially impacted mission capabilities. Before “physical distancing,” more close contacts per case were identified which likely degraded the abilities of various work centers. Because the hospital and clinics rapidly implemented screening measures for patients and staff at entry points, limited the usual in-person team meetings and huddles, creatively cohorted staff to mission essential work schedules, and maximized telework, there was minimal impact to mission readiness at the hospital/clinics. Nonetheless, the pandemic initially resulted in only essential medical services being offered to patients. Routine dentistry and preventive services were not offered.

During a pandemic, leaders need to build resiliency in operations, achieving critical functions with reduced manpower and strategically schedule staff to avoid mission failure. With early implementation of the various hierarchies of control, less close contacts per positive case were identified. During the recovery phase, executive leaders will need to continue strategies supporting worker protection and resiliency of mission capabilities.

CDC guidance initially lagged for military public health officials operating internationally. For example, the first COVID-19 case at this facility would not have been recommended for testing based on CDC criteria at the time but was tested under partner nation requirements. Also, no specific guidance for contact tracing was published at the time. Additionally, CDC guidance for screening travel requirements was U.S. centric and at times difficult to interpret for U.S. citizens living overseas. U.S. military public health officials and leaders, while following CDC principles, may need to tailor certain policies and procedures for their locations.
Non-pharmaceutical interventions (NPIs) are likely effective at preventing the spread of respiratory infections. On 11 March, the partner nation implemented restrictive measures prohibiting “non-essential” activities and all military and DoD staff complied with the restrictions. The Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) is a surveillance system utilized by public health practitioners to monitor and assess a population for occurrence of disease, injury, and potential exposure to hazards. ESSENCE from January to April 2020 (Fig. 2) showed a drop in influenza and influenza-like illness (ILI) during this time period. For comparison, the syndromic surveillance data for 2019 (when there were no NPIs) did not show a decrease in influenza and ILI cases. The decreased rates are suspected to be from aggressive physical distancing. Rates of ILI dropped even before the CDC recommendation for wearing a facial covering on April 3, 2020 or the Navy Administrative requirement to wear a facial covering on April 5, 2020. However, this decrease could also represent decreased patient visits because only urgent or emergent care was provided during this time period.

The findings in this report have some limitations. First, the information is descriptive in nature and causal relationships cannot be ascertained. The number of cases is small which makes it difficult to draw any significant conclusions.

Nonetheless, this report details comprehensive information for a small military population. It also describes some of the public health challenges of working in an international environment.

The military, especially in an overseas location, has a “no fail” mission. Rapid identification and contact tracing of cases and collaboration with partner nations are essential to successfully mitigate the spread of infection and maintain military readiness.

FUNDING

None declared.

CONFLICT OF INTEREST STATEMENT

None declared.

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