

Influenza-Like Illness Among Personnel Responding to U.S. Quarantine of Cruise Ship Passengers Exposed to SARS-CoV-2

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Objectives: Before community transmission of COVID-19 was recognized in the United States, cruise ship passengers with high risk for exposure to SARS-CoV-2 were repatriated and quarantined. We describe cases of influenza-like illness (ILI) among responders. **Methods:** We reviewed situation reports and responder illness reports to characterize ill responders, including illness onset date, symptoms, fever, diagnostic tests, potential breaches in PPE use, and return to work status. **Results:** Among 339 responders, nine (3%) reported ILI. No breaches in PPE were reported. Three responders with ILI were tested for both SARS-CoV-2 infection and influenza A; none tested positive for SARS-CoV-2 infection and two tested positive for influenza A. **Conclusions:** Despite an outbreak of ILI among responders, none were diagnosed with COVID-19, suggesting preventive measures in place might have been sufficient to prevent responders from SARS-CoV-2 exposure.

Keywords: COVID-19, influenza A, influenza-like illness, novel coronavirus, occupational health, quarantine, SARS-CoV-2

Coronavirus disease 2019 (COVID-19) results from infection with SARS-CoV-2 and typically causes influenza-like symptoms such as fever, cough, and shortness of breath.^{1,2} Gastrointestinal symptoms (eg, anorexia, nausea, vomiting, diarrhea) and fatigue and malaise also are reported with infection.³ COVID-19 can result in respiratory distress and death.^{1,2,4} To slow the introduction and community transmission of SARS-CoV-2 in the United States, federally mandated quarantine was used in the early phase of the 2020 pandemic as a strategy to restrict movement and monitor individuals at high risk for exposure (eg, traveled from Hubei Province, China, or traveled on cruise ships experiencing COVID-19 outbreaks at sea).⁵ This report stems from one incident during early February 2020 in which over 2,650 cruise ship

passengers and staff were quarantined for 12 days on a ship near Yokohama, Japan due to an outbreak of COVID-19.⁶ At that time no community transmission of COVID-19 had been identified in the 50 U.S. states, but concerns were high about potential spread. Thus, following the initial quarantine of potentially exposed cruise ship passengers and staff in Japan, the United States government repatriated 171 U.S. passengers to an Air Force base in California and instituted a further 2-week quarantine.⁶

Multiple federal agencies were involved in repatriating passengers from the cruise ship. The Department of Health and Human Services (HHS) Office of the Assistant Secretary for Preparedness and Response (ASPR) coordinated the multiagency Incident Management Team (IMT). ASPR deployed HHS Commissioned Corps officers from the United States Public Health Service*, and National Disaster Medical System (NDMS) Disaster Assistance Medical Teams (DMAT) and Disaster Mortuary Operations Response Teams (DMORT) to provide medical and support services for the passengers. A team from the U.S. Centers for Disease Control and Prevention (CDC) led the quarantine and laboratory sampling efforts and provided guidance on infection prevention and control practices and occupational safety among responders. Other responding agencies included United States Marshals Service to enforce federal quarantine and isolation orders, U.S. Department of Veterans Affairs to offer support to quarantined and isolated veterans, HHS Administration for Children and Families, Emergency Medical Services (EMS) for patient transfer, and contracted services such as language interpretation.

Tasks commonly performed by responders in the quarantine area included food and supplies delivery (mostly NDMS DMAT), temperature and symptom monitoring (mostly NDMS DMAT), behavioral health consultation (IMT Behavioral Health Team), medical assessment (NDMS DMORT), Persons Under Investigation⁷ (PUI) case investigation (CDC), oropharyngeal and nasopharyngeal specimen collection (CDC and NDMS DMORT), and laboratory results notification (CDC). Contracting services provided translation and emergency medical services, which required entry into the quarantine area and sometimes close contact with passengers. Contracting services also provided laundry and trash services in the quarantine area, but these services required no contact with passengers. Most HHS responders entered the quarantine area. Deputy U.S. marshals were posted outside but rarely entered the quarantine area, and typically had either no or minimal contact with passengers. We describe quarantine preventive measures aimed to reduce the likelihood of SARS-CoV-2 transmission that helped quickly identify cases of laboratory-confirmed influenza A and influenza-like illness (ILI) among responders.

METHODS

Federally mandated quarantine was used to slow the introduction and community transmission of SARS-CoV-2 in the United States. To that end, preventive measures implemented during quarantine included protecting responders from SARS-CoV-2 exposure, and responder monitoring was conducted in case of inadvertent or unknown SARS-CoV-2 exposure. The IMT kept daily accountability

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Clinical significance: Despite an outbreak of influenza-like illness among public health responders during the quarantine of cruise ship passengers before recognized community transmission of COVID-19 in the United States, no responders were diagnosed with COVID-19. Preventive measures including immunization, personal protective equipment, social distancing, and readiness training are paramount to protect responders.

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logs tracking individual responders by agency and team (blank form provided in supplemental materials). We used these logs to identify the number of responders who participated in the response during February 17 to March 2, 2020, and their agencies. The IMT Safety Officer distributed daily situation reports by email to the IMT and agency liaisons describing any responder health and safety concerns. The IMT Safety Officer also maintained daily responder illness reports for any ill responders, including name, agency, team, contact information, primary role during deployment, symptoms, symptom onset date, respiratory symptoms (Yes/No), fever (Yes/No), PUI (Yes/No), disposition, and return to work date (blank form provided in supplemental materials). HHS responders were issued their own oral thermometer and were trained to check their temperatures prior to reporting to their work shift and when ending their work shift. During the response, all responders were asked to report any fever, cough, shortness of breath, or other illnesses to their team leaders. Team leaders were asked to report any health or safety concerns to the IMT Safety Officer.

The IMT Safety Officer coordinated with the IMT Chief Medical Officer to address responder health concerns. If the IMT Chief Medical Officer suspected a responder with ILI may have had COVID-19, s/he consulted CDC's onsite PUI Team representative to determine if the responder was considered a PUI for SARS-CoV-2. ILI was considered an abrupt onset of fever, myalgia, headache, severe malaise, nonproductive cough, sore throat, or rhinitis. Ill responders were asked about tasks, infection prevention and control practices, and potential breaches in PPE. Responders identified as PUIs were tested for SARS-CoV-2 infection and required to self-isolate while the results were pending. Specimens were collected by oropharyngeal and nasopharyngeal swab and tested by real-time reverse transcription polymerase chain reaction (RT-PCR) for SARS-CoV-2 at CDC in Atlanta, GA. In general, responders with ILI who reported limited interactions with quarantined passengers from safe distances and proper PPE use with no breaches were not considered PUIs; these responders were referred to local healthcare providers for evaluation and treatment, which often included diagnostic testing using a rapid influenza diagnostic test. For this analysis, responders testing positive for influenza A using a rapid influenza diagnostic test were considered influenza A cases.⁸ Responders not considered PUIs were not tested for SARS-CoV-2 infection. Return to work for an individual responder was determined by an HHS risk assessment protocol or the responder's team lead, depending on the agency. Contractor health and safety guidance was provided by the employer; contractors were not assessed by HHS responders for ILI or other illnesses.

RESULTS

Preventive measures implemented during quarantine included protecting responders from SARS-CoV-2 exposure. Throughout quarantine, any persons (repatriated cruise ship passengers or responders) confirmed or suspected of having COVID-19 were isolated. Before repatriation, passengers identified as having laboratory-confirmed COVID-19 immediately prior to the flight were allowed to board but were separated from other passengers by a physical barrier (plastic sheeting). Passengers who developed fever or other symptoms consistent with COVID-19, or whose SARS-CoV-2 test results in Japan were positive by the time of arrival in the United States, were taken directly to community hospitals.⁹ The remaining passengers were housed on the base in one- or two-person rooms located in two separate areas with installed fenced perimeters. During their 14-day quarantine, some PUIs were confirmed as having COVID-19 based on PCR test results collected either in Japan or during quarantine on the military base. At the time, CDC defined PUIs as persons with fever or signs/symptoms of lower respiratory illness and who had close contact with a laboratory-confirmed COVID-19 patient within 14 days of

symptom onset. As was true for passengers identified as having confirmed COVID-19, newly identified PUIs were transferred from the Air Force base to healthcare facilities or home isolation, if feasible. At the time of repatriation, 22 of 171 passengers were identified as having COVID-19 based on RT-PCR results obtained from the Japanese Ministry of Health, Labour, and Welfare or CDC after arrival in the United States; these passengers were transferred to healthcare facilities or home isolation. Of the 149 passengers quarantined at the Air Force base, six had their quarantine period extended because their roommate in the quarantine area tested positive for SARS-CoV-2 infection; the length of quarantine extension was 14 days from the date of last close contact.

Use of personal protective equipment (PPE) was required for all responders who entered the quarantine area based on the published interim CDC guidance at that time. At a minimum, responders performing support services that involved brief interactions, such as food delivery and temperature checks (scanning forehead with a noncontact infrared thermometer or observed self-measurement using an oral thermometer) donned a surgical mask, eye protection (eg, face shield), and gloves (ie, limited PPE). Additional PPE requirements for responders conducting medical assessments, requiring closer contact with passengers (<6 ft for more than a brief amount of time), or entering passenger rooms included a fit-tested N-95 respirator and disposable gown (ie, full PPE). The two separate areas with installed fenced perimeters where passengers were housed during quarantine each included a single, clearly marked entrance/exit point for responders with a tent for donning and doffing stocked with PPE and a handwashing station. Training and regular spot checks of PPE donning and doffing were conducted by the IMT Safety Officer. Not all agencies required PPE training before responders arrived on site, and responders had a range of prior experiences with PPE.

From February 17 to March 2, 2020, a total of 339 staff from six federal agencies responded to support repatriated cruise ship passengers at the base. We evaluated data on responders who provided care and monitoring for passengers during the original 14-day quarantine period, including 211 (62%) representing HHS (175 NDMS, 25 CDC, 8 ASPR, and three Administration for Children and Families); 117 (35%) deputy U.S. marshals; and seven representing U.S. Department of Veterans Affairs. Responder readiness requirements were dictated by the deploying agency. Respiratory fit-testing was available on-site. Respiratory fit testing was performed using the Qualitative Fit Test Saccharin Solution Aerosol Protocol according to the Occupational Safety and Health Administration (OSHA) Appendix A 29 CFR 1910.134—Fit Testing Procedures—General Requirements. The 2019 to 2020 seasonal influenza vaccination was recommended but not required for some responders (DMAT, DMORT, United States Marshals Service) and required for other responders (CDC, all United States Public Health Service officers).

Twelve responder health and safety incidents were reported (Table 1). Nine responders reported signs or symptoms consistent with ILI (Fig. 1), of whom eight (89%) deployed to the repatriation site and had symptom onset during February 21 to 24, 2020; the remaining responder with ILI enforced quarantine on a confirmed COVID-19 patient in a hospital and had a later symptom onset date. Of the eight responders with ILI at the repatriation site, four responders were from the same agency and primarily tasked with providing clinical care to the passengers inside the fenced-in quarantine area and were required to wear full PPE when doing so. When not in the quarantine area providing clinical support, these responders spent several hours each shift in the staging areas (several large tents) outside of the quarantine area where responders freely interacted; there were no PPE or social distancing requirements for areas outside the fenced-in quarantine area. Additionally, these four responders from the same agency shuttled together daily to the base from their hotel located approximately one hour away.

TABLE 1. Number of Responders* Reporting Health or Safety Incidents or Influenza-like Illness (ILI) or Influenza A, Received Diagnostic Tests, and Missed Days from Work, February 17 to March 2

Total responders	339**
Health or safety incidents, <i>n</i> (%)	12 (3.5%)
Influenza-like illness (ILI), <i>n</i> (%)	9 (2.7%)
Tested for influenza A [†]	4 (1.2%)
Laboratory-confirmed influenza A	3 (0.9%)
Tested for COVID-19 [‡]	3 (0.9%)
Laboratory-confirmed COVID-19	0
Mean days missed, <i>n</i> (range)	3.8 (<1–11)

*Responders supporting repatriated U.S. cruise ship passengers who were quarantined at an Air Force Base in California.

**An estimated 200 (59%) responders likely entered quarantine area based on agency.

[†]Rapid influenza diagnostic tests (RIDTs).

[‡]Centers for Disease Control and Prevention (CDC) 2019–Novel Coronavirus (2019-nCoV) Real-Time Reverse Transcriptase (RT)-PCR Diagnostic Panel.

Two other responders with ILI were from another agency and conducted a range of tasks inside the quarantine area requiring full PPE (PUI investigations and laboratory specimen collection) and therefore spent considerable time in the staging areas as well, but also had responsibilities with IMT and spent most of their time at the Incident Command Center (located in a nearby building on base). The remaining two responders with ILI at the repatriation site were from different agencies, one responder had the primary task of temperature screening passengers and spent considerable time in the staging areas as well as inside the quarantine area in limited PPE, and the other responder was part of the IMT and was largely located at the Incident Command Center and spent no time in the quarantine area.

The seven responders with ILI who performed tasks inside the quarantine area reported no breaches in PPE use. In consultation with CDC's PUI Team representative, the IMT Chief Medical Officer designated two of the seven responders as PUIs based on the nature and duration of their activities that included providing clinical support to passengers; both tested negative for SARS-CoV-2

infection and self-isolated while awaiting results. An additional responder not at the repatriation site but who had enforced quarantine on a confirmed COVID-19 patient in a hospital also tested negative for SARS-CoV-2.¹⁰ Of the nine responders with ILI, four (44%) were tested for influenza A, resulting in three testing positive and one testing negative. All three responders tested for SARS-CoV-2 infection were also tested for influenza A, and two of three tested positive for influenza A. At least two responders with ILI had not received an influenza vaccine pre-deployment. On February 22, 2020 after several responders were diagnosed with influenza, approximately 75 responders were administered oseltamivir for influenza prophylaxis (Fig. 1).

Eleven (3%) responders were excluded from work during the response because of health and safety concerns. Responders were excluded from an average of four days of work (range: <1 to 11 d) during February 17 to March 2 for a total of 43 workdays (approximately 516 h). Of the workdays missed, 41 (95%) were due to ILI in nine responders.

DISCUSSION

We describe a cluster of ILI, including three confirmed cases of influenza A, among responders to the repatriation of cruise ship passengers at an Air Force base in California. Influenza A and other acute respiratory illnesses have similar clinical presentations to COVID-19,^{11,12} which made it difficult to identify whether the ill responders had influenza A or COVID-19, the novel disease for which the responders were charged with preventing transmission.⁶ At the time of repatriation, SARS-CoV-2 testing and surveillance capacity were extremely limited in the United States; however, no responders were diagnosed with COVID-19, suggesting preventive measures in place might have been sufficient to prevent responders from SARS-CoV-2 exposure, despite the outbreak of ILI.

Responders underwent active monitoring for COVID-19 respiratory symptoms during their deployment and were required to monitor their temperature twice daily and report any fever or respiratory symptoms to their team lead. Active monitoring extended for 14 days following the end of deployment to reduce the likelihood of community transmission of SARS-CoV-2 after they returned home. None of the responders were diagnosed with COVID-19 during the deployment or within 14 days of returning

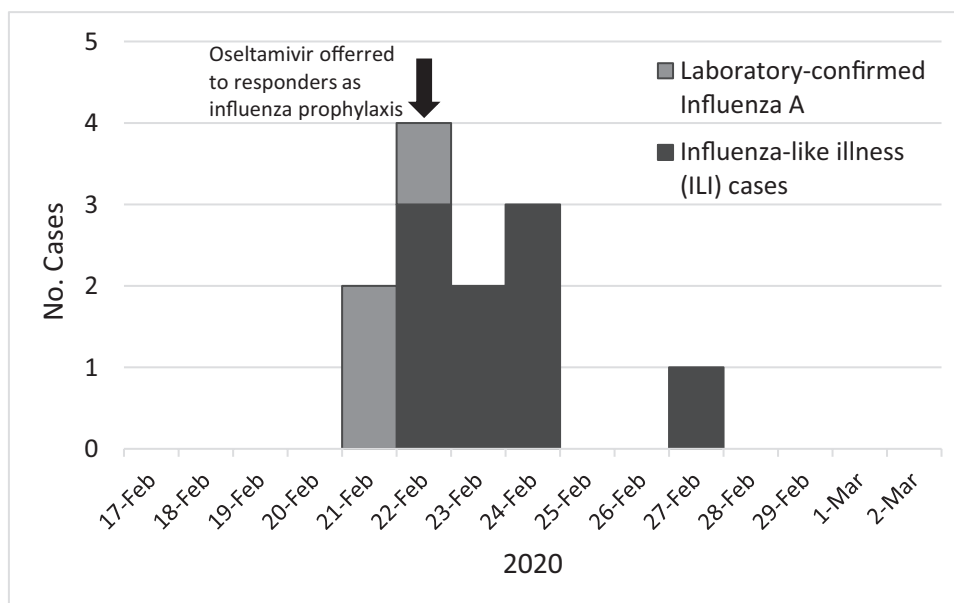


FIGURE 1. Number of responders* with influenza-like illness (ILI) by laboratory-confirmed influenza A diagnosis, by illness onset date, February 17 to March 2, 2020.

home, suggesting that the safety measures implemented (ie, engineering controls, administrative controls, and PPE practices) may have prevented them from acquiring COVID-19 during the response. Active symptom monitoring did not include gastrointestinal symptoms; however, no responders reported gastrointestinal symptoms during deployment. A study published after this deployment found more than half of COVID-19 patients had gastrointestinal symptoms, such as loss of appetite, diarrhea, vomiting, nausea or abdominal pain.³ Loss of a sense of smell or taste also has been associated with COVID-19, and was also not monitored as this association was not known during the quarantine period.¹³

None of the responders with ILI reported a breach in PPE. Had breaches been reported, the responder's COVID-19 risk category would have been elevated, and the responder would have been considered a PUI. It is possible that breaches in PPE went unreported for fear of perceived negative consequences (eg, work exclusion). For responders who entered the quarantine area and developed fever or respiratory symptoms with no reported breach in PPE, the risk category was low according to CDC.¹⁴ These responders were allowed to seek medical care from local providers as needed and cleared to return to work according to HHS risk-assessment protocols. Until February 29, 2020, responders had no workplace exclusion following deployment. However, the identification of community transmission in the adjacent county resulted in a change in policy, and beginning February 29, 2020, returning CDC responders were considered as medium risk, which resulted in a two-week workplace exclusion after returning home (eg, telework from home for those without clinical positions).¹⁵

Three responders who were tested for SARS-CoV-2 had negative results; all three were also tested for influenza A and two tested positive. Responder PUI determination in the field setting was challenging: the majority of this public health response occurred before community transmission of SARS-CoV-2 was recognized in the United States.¹⁶ PUI determination in responders with ILI was determined to require both clinical features of COVID-19 (fever and lower respiratory signs/symptoms) and exposure based on healthcare worker guidance (ie, contact time, tasks performed, PPE worn and potential breaches). Consequently, testing responders for COVID-19 at that time raised several issues, including the need to notify local and state public health authorities and isolate responders in their hotel rooms until results returned. Isolating responders required other responders to deliver their meals and supplies while wearing limited PPE, which could have raised safety concerns with hotel management or others in the public about potential risk for community transmission. This led to broader concerns regarding the threshold for designating responders as PUIs in a field setting. Should any responder who entered the quarantine area and developed a fever or respiratory symptoms, regardless of reported PPE breaches, have been considered a PUI and tested for SARS-CoV-2 infection, and (accordingly) require a negative test before returning to work? While this concern was discussed in the field that approach was not taken for what was considered at the time a low level of risk. Another challenge to this field investigation was that delays in the return of SARS-CoV-2 test results could have led to staffing shortages during a public health response. Responders who were not designated as a PUI sought medical care at local healthcare facilities and were sometimes tested for influenza A using a rapid diagnostic test. A further challenge was that local healthcare providers caring for responders experienced diagnostic challenges and anxiety upon learning the responder was potentially exposed to COVID-19 and had to determine whether to test the responder for SARS-CoV-2 infection.

During this response, prevention efforts (social distancing and minimizing contact with quarantined cruise ship passengers while wearing PPE) were largely aimed at preventing transmission of SARS-CoV-2 among responders; however, outside of the quarantine area there were no social distancing measures or face mask

requirements for responders, including in the Incident Command Center. The response took place during February and March when influenza A was circulating widely in the United States.¹⁷ Of note, following several confirmed cases of influenza A among responders approximately 75 responders were prescribed oseltamivir on February 22, 2020 as influenza prophylaxis and new cases of ILI sharply declined thereafter as shown in Fig. 1. Responders traveled from many destinations, worked long hours in close proximity and in stressful situations, stayed in groups at area hotels, and commuted in vehicles together to the Air Force base. In a different response scenario, such as during a hurricane response, responders with ILI would raise concerns and elicit responses from field leadership; however, the concerns for responder health would unlikely overlap the mission objectives. In this case, responders with ILI presented similarly to passengers and other persons with COVID-19,¹¹ and therefore had to be evaluated in the context of the response efforts to reduce the likelihood of spreading the novel disease. This confluence of responder health and response objectives was particularly acute given that community transmission of COVID-19 had not yet been recognized in the United States during the first 10 days of the quarantine.¹⁸

Agencies that deploy emergency responders should maximize preparedness before a disaster occurs to reduce the burden of work-related illnesses or injuries in the field setting. Preparedness includes vaccinations against infectious diseases when indicated, but more broadly it includes medical clearance, respirator fit-testing and clearance, relevant training, and adequate supplies to protect against novel threats. Not all responders during the repatriation of cruise ship passengers at the Air Force base in California were required to have received the seasonal influenza vaccine, which could have contributed to the cluster of influenza A cases and cases of ILI among responders. All responders without contraindications should be vaccinated against seasonal influenza¹⁹ and other respiratory diseases as indicated, to reduce the likelihood of infectious disease outbreaks from these pathogens during responses to disasters. There was no approved COVID-19 vaccine available at that time.²⁰ During the quarantine of repatriated cruise ship passengers, responders relied on nonpharmaceutical interventions, such as social distancing from passengers, minimizing contact with passengers, and using appropriate PPE for protection; these measures were limited to the quarantine area, which could account for the lack of identified COVID-19 transmission among responders, but likely spread of influenza A and ILI among responders during the response. During most of the quarantine during February 17 to March 2, 2020, there was no known ongoing community transmission of SARS-CoV-2 in the United States, and the objective was to prevent potentially exposed passengers from the cruise ship from returning to their communities and contributing to disease transmission.⁶ Once it became clear that community transmission was widespread in the United States, public health strategies transitioned from federally managed quarantine and isolation intended to prevent the introduction of SARS-CoV-2 into the United States to home-based quarantine or isolation as well as other community mitigation strategies to slow the spread.⁹ This condensed timeline between the introduction of SARS-CoV-2 into the United States and sustained transmission throughout the country underscores the need for healthcare providers and other responders to maintain their readiness for working during times of infectious disease outbreaks.

Several challenges occurred during the repatriation of cruise ship passengers exposed to SARS-CoV-2. As COVID-19 is a novel disease, new scientific findings have been reported since February 2020. Many of these findings would have been relevant to the response but were not well-established at the time, including the possibility of aerosolization of the virus, asymptomatic or pre-symptomatic transmission, the presence of gastrointestinal symptoms, and association with loss of taste or smell.^{5,13,21,22} Even during the 14-day

Priority 1
Ensure optimal care options for all hospitalized patients, lessen the risk for nosocomial infections, and maintain the integrity of the healthcare system
<ul style="list-style-type: none"> • Hospitalized patients • Symptomatic healthcare workers
Priority 2
Ensure that those who are at highest risk of complication of infection are rapidly identified and appropriately triaged
<ul style="list-style-type: none"> • Patients in long-term care facilities with symptoms • Patients 65 years of age and older with symptoms • Patients with underlying conditions with symptoms • First responders with symptoms
Priority 3
As resources allow, test individuals in the surrounding community of rapidly increasing hospital cases to decrease community spread, and ensure health of essential workers
<ul style="list-style-type: none"> • Critical infrastructure workers with symptoms • Individuals with symptoms who do not meet any of the above criteria • Health care workers and first responders • Individuals with mild symptoms in communities experiencing high COVID-19 hospitalizations
NON-PRIORITY
Individuals without symptoms

FIGURE 2. Criteria guiding evaluation and laboratory testing for COVID-19 used by responders during February to March 2020*.

quarantine period, guidelines changed rapidly and responders had to adapt accordingly. At the individual responder level, active monitoring of temperature and symptoms for responders in the field was not consistently applied. Further, active monitoring was handled by individual teams rather than having a standard protocol for all responders. Additionally, the process of assessing responders with ILI was completed in the field during the response. ILI in the context of a COVID-19 response added additional complexity because COVID-19 can present with symptoms similar to ILI.^{1,2,4,11,12} Responders deploy to protect public health during infectious disease outbreaks and do not want to unknowingly contribute to disease transmission during the response. In retrospect, responders with ILI during the response determined not to be PUIs should have not sought care from local healthcare providers, because, although not suspected based on the assessment process in place at that time, they could have had COVID-19, and community transmission of SARS-CoV-2 was likely already occurring in the area.²³ For future infectious disease outbreak responses, processes for how to assess disease conditions that might mimic the inciting cause should be defined ahead of time, including testing considerations (Fig. 2), isolation procedures, authority notifications, and return to work criteria. Additionally, responder monitoring systems, such as CDC's Text Illness Monitoring (TIM) system that uses daily text messaging to monitor for fever or select symptoms, should be used to analyze data of responders by deployment location to identify potential outbreaks among responders; TIM data for individual responders or responders by deployment location were not available for analysis for the COVID-19 response.

CONCLUSION

During the repatriation of cruise ship passengers exposed to SARS-CoV-2 at an Air Force base in California, an outbreak of three

cases of influenza A and six cases of ILI occurred among responders and resulted in responders missing a combined 41 workdays. Although three responders were tested for SARS-CoV-2 infection, no responders were diagnosed with COVID-19, suggesting the prevention methods in place may have been sufficient to prevent responders from exposure. It is critical that responders to humanitarian and public health responses are as protected as possible against potential hazards, including infectious diseases through immunization as available, use of PPE, social distancing, readiness training, and other measures, so they can continue to provide disaster support.

*United States Public Health Service officers serve in a myriad of federal agencies within the Department of Health and Human Services (HHS, eg, Centers for Disease Control and Prevention, Indian Health Service, National Institutes of Health) and other agencies (eg, Environmental Protection Agency, United States Department of Agriculture). For the purposes of this manuscript, they are included as HHS responders along with civilian employees.

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