

Derleme/Review Article

Nonpharmaceutical Interventions for Military Populations During Pandemic Influenza

Selim Kılıç^{1,2*}, Gregory C. Gray²

¹*Department of Epidemiology, Gülhane Military Medical School, Ankara, Turkey,* ²*Director, Center for Emerging Infectious Diseases, and Professor, Department of Epidemiology, College of Public Health University of Iowa, 200 Hawkins Dr, C21K GH, Iowa City, IA, USA.*

**Selim KILIÇ, MD, Center for Emerging Infectious Diseases, College of Public Health University of Iowa, 2501 Crosspark Road MTF Building B145, Coralville, IA 52241. USA. E-mail: drselimkiloc@yahoo.com*

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Abstract: Influenza causes substantial illness and loss of work days among young adults, and outbreaks can affect the preparedness of military units. In an influenza pandemic, people who live in confined settings have greater risk of infection. Military trainees are at particularly high risk. Because of likely unavailability of vaccines and antiviral drugs at the start of a pandemic and for many months thereafter, nonpharmaceutical interventions may be very important. During a pandemic, it seems prudent that military public health officials employ at least several nonpharmaceutical interventions. For example frequent handwashing and respiratory hygiene/cough etiquette should be strongly encouraged among soldiers. Head-to-toe sleeping, a "no-cost" intervention should be for crowded berthing areas. Isolation of patients with influenza and quarantine of their close contacts should be employed. Masks and alcohol-based hand rubs may be employed among those at highest risk. Finally, whenever possible military planners should, reduce crowding and limit the interaction of training cohorts to reduce risk of influenza virus transmission.

Key words: nonpharmaceutical interventions, military populations, pandemic influenza

Askeri Birlikler İçin İnfluenza Pandemisinde İlaç-dışı Müdahaleler

Özet: İnfluenza genç yetişkinlerde ciddi hastalığa ve işgünü kaybına neden olmakta, ve salgınlar askeri birimlerin hazırlık durumlarını etkilemektedir. Bir influenza pandemisinde kapalı alanlarda yaşayanlar daha büyük enfeksiyon riski taşımaktadırlar. Askeri personel özellikle yüksek risk altındadır. Pandeminin başında ve sonraki ilk aylarda uygulanabilecek etkili aşı ve antiviral ilaçların bulunmaması, ilaç-dışı müdahaleleri son derece önemli hale getirebilmektedir. Pandemi sırasında, askeri halk sağlığı çalışanlarının çeşitli ilaç-dışı müdahalelerde bulunabilmesi mümkündür. Örneğin sık el yıkama ve öksürme sırasında ağzı kapatma askerler arasında teşvik edilmeli, önemle vurgulanmalıdır. Başı arkadaşının ayağı yönünde uyuma hiçbir maliyeti olmayan bir girişimdir ve kalabalık ranzaların olduğu yerlerde uygulanmalıdır. İnfluenza hastalarının izolasyonu ve bu kişilerin yakın temasta buldukları için karantina uygulanması sağlanmalıdır. İleri derecede yüksek riskin sözkonusu olduğu durumlarda maske ve alkol bazlı el dezenfektanları kullanılmalıdır. Son olarak, influenza virüsünün geçiş riskini azaltmak için, mümkün olduğu hallerde askeri planlamadan sorumlu kişiler toplu yaşam yerlerinde kalabalıklığı azaltmalı ve eğitim gören personelin birbirleri ile etkileşimini sınırlamalıdır.

Anahtar kelimeler: İlaç-dışı müdahaleler, askeri topluluklar, pandemik influenza

INTRODUCTION

Fifteen million (>25%) of 57 million annual deaths worldwide are estimated to be directly related to infectious diseases. Of these it is estimated that 4 million deaths (7%) occur as a consequence of respiratory infections (1). A large portion of respiratory illnesses are due to influenza viruses. For example, it has been estimated that 3–5 million people suffer severe influenza each year, and 250,000–500,000 die from their illness (2).

Influenza causes substantial illness and loss of work days among young adults, and outbreaks can affect the preparedness of military units (3). Influenza and other respiratory infections are the leading cause of outpatient illness and a major cause of infectious disease hospitalization in US military personnel (4). Some reports document influenza outbreaks in military bases that reach attack rates as high as 37% to 45% (5, 6), and similar rates were noted during outbreaks on naval ships (7).

The occurrence of influenza in human populations has been documented in considerable detail for at least the past three centuries, but actual accounts of influenza probably date back further, to the 12th century. Most lessons regarding the epidemiology of pandemic influenza have been learned from the three well-documented pandemics of the 20th century, the `Spanish flu` which occurred during the period 1918 to 1919, the `Asian flu` which occurred from 1957 to 1958, and the `Hong Kong flu` which ran its course from 1968 to 1969 (8-10).

During the 1918–1919 influenza pandemic, an estimated one third of the world’s population was infected and had clinically apparent illnesses. The disease was exceptionally severe. Case-fatality rates were often greater than 2.5%, compared to the < 0.1% average in other influenza pandemics. Total deaths were estimated at ≈50 million and were arguably as high as 100 million (11). Four times more humans died during the pandemic of 1918–1919 than during all of World War I (12)). The origin of the 1918 pandemic virus or viruses is a matter of debate. Hammond et.al. described an outbreak of respiratory infection that may have represented an emergence of a novel virus leading to the pandemic. Termed an outbreak of purulent bronchitis, the 1916 winter epidemic occurred in a large British Army base at Etaples, near the coast south of Boulogne in northern France.. This camp housed 100,000 soldiers on any given day and during the period 1916 to 1918 more than one million soldiers stayed in Etaples enroute to the Western Front. In the 1916 outbreak soldiers suffered from an acute respiratory infection, high temperature, and cough at a time when recognized influenza was present. With most soldiers housed in tents or temporary wooden barracks, undoubtedly conditions were ideal for the spread of a respiratory viruses (13, 14). At about the same time, a similar illness was affecting soldiers in large numbers at the British army camp in Aldershot, England. Medical officers at the camp concluded that “these patients suffer from a primary invasion of their lung tissues by the B influenza”. In the United States, the first evidence of novel virus activity was reported early 1918 at Camp Funston, Kansas. In March, approximately 1100 soldiers assigned to the camp were hospitalized for influenza—approximately 22% developed pneumonias (>90% lobar), of which approximately 20% were fatal (15).

While the source of 1918 pandemic virus remains a matter of debate, it is clear that military populations suffered greatly from the pandemic. Often those living in closest proximity suffered the most. For example during 1918 to 1920 in Japan, the highest

influenza mortality rates were found among otherwise healthy 20-30 year-old Army soldiers who lived together in barracks and had no external contact with other populations (16). Military trainees and shipboard personnel were particularly at high risk of developing influenza (12).

Between 1965 and 1970, respiratory tract infections represented one of the most common illnesses occurring among US Army personnel stationed in the Republic of Vietnam (17). Respiratory tract infectious ranked approximately equal to diarrheal diseases as a cause of hospitalization or assignment to quarters. During the fall of 1968, influenza due to the A2 Hong Kong strain (H3N2) was widespread, but not associated with marked increases in rates of hospitalization or mortality (17). Some publications report an influenza epidemic in Italian and Yugoslavian armies during the `Asian flu` and `Hong Kong flu` pandemics (18, 19).

Although influenza vaccination is the primary method for preventing influenza and its severe complications, supplies of vaccines and antiviral drugs – the two most important medical interventions for reducing illness and deaths during a pandemic – will be likely be sparse at the start of a pandemic and for many months thereafter. Consider present resources, many developing countries will have no access to vaccines throughout the duration of a pandemic. At present manufacturing capacity, which has recently quadrupled, it will take a decade to produce enough antivirals to treat 20% of the world’s population (20). Hence, nonpharmaceutical interventions (Table 1) may be very important during a pandemic (21, 22).

Table 1. Nonpharmaceutical interventions against influenza available to military public health professionals

Patient isolation	Engineering controls
Quarantine of patient contacts	Frequent hand washes
Reduce crowding	Wearing of masks
Head to toe alignment of beds	Cough etiquette
Reduce mixing of military cohort	Reduce contact with civilians
Reduce public gathering	Aggressive ILI screening
Alcohol based hand rubs	Maintaining personal distance

ILI= influenza-like-illness

POSSIBLE NONPHARMACEUTICAL INTERVENTIONS

a. Isolation of patients and quarantine of contacts

Beyond widespread vaccination, isolating symptomatic influenza patients is one of the most important measures that can be taken to reduce influenza transmission within a community. The most severely ill patients are the most likely to seek hospital care. The critical importance of hospitals in providing health care during a pandemic cannot be overstated and has been addressed by different study sources (23, 24). In an influenza epidemic, hospitals will face several key challenges. First, hospitals must protect their own staff from infection and avoid becoming “amplifiers” of disease. In 1918–19, even the best-equipped hospitals had little to offer influenza victims. However, today even though antiviral therapy may be limited, the availability of oxygen, ventilators, antibiotics, and parenteral fluids could make a critical difference for patients (23). In closed settings (e.g., military barracks and college dormitories), early identification and isolation of patients in 1918 usually did not stop virus transmission, but it did appear to decrease attack rates (2). Early isolation of patients and quarantine of contacts successfully interrupted SARS virus transmission, but influenza’s shorter incubation period and earlier peak infectivity, plus the presence of mild cases and possibility of transmission without symptoms, suggest that these measures would be considerably less successful than they were for controlling SARS virus spread (25–29).

b. Handwashing, disinfection, cough etiquette

The influenza virus survives on the hands for less than five minutes, but regular hand-washing is a commonsense action that should be widely followed (30). Handwashing has been shown to reduce the transmission of respiratory disease (28, 31, 32), in Ryan et al. study it was found that a 45% reduction in total outpatient visits for respiratory illness was observed after implementation of the handwashing program (32), although no data demonstrates that handwashing deters the spread of influenza within a community (32, 33).

Handwashing has been advocated by the US Center for Disease Control and Prevention (CDC) to prevent SARS in healthcare and community settings. The CDC recently updated their recommendations for hand hygiene in healthcare settings to include hand antisepsis with alcohol-based hand rubs, which are effective against a variety of bacteria and viruses. These hand rubs are endorsed in the healthcare setting

as either a supplement to traditional handwashing or as a primary means of hand hygiene if hands are not visibly soiled (34).

Recommendations for “respiratory hygiene/cough etiquette,” such as covering one’s mouth when coughing and avoiding spitting, have been made more on the basis of plausibility than based on evidence from controlled studies (28, 30).

c. Maintaining personal distance

It has been recommended that individuals maintain a distance of three feet or more during a pandemic so as to diminish the number of contacts with people who may be infected. The efficacy of this measure is unknown. It is typically assumed that transmission of droplet-spread diseases, such as influenza, is limited to “close contacts”—that is, being within three to six feet of an infected person (30, 35).

d. Avoiding crowding

A WHO consultation in 1959 concluded that the 1957 influenza pandemic tended to appear first in army units, schools, and other groups where close contact between humans was common. Also noting the reduced incidence in rural areas, the consultation suggested that avoiding crowding could reduce the peak incidence of an epidemic and spread it over many, rather than a few, weeks (29).

e. Administrative or social controls

For patients with diseases where airborne and droplet precautions are necessary, and private rooms are not available, it is recommended that an individual patient be grouped with other patients who have the same active infection by the same microorganism. A different method of cohorting, which is practiced in military basic training centers, involves minimizing contact between training companies of approximately 100 to 200 people. While cohorting may seem like an attractive control measure, current training structures (barracks, classrooms, dining, recreational, and medical facilities) may make it difficult to effectively isolate groups from one another for a significant amount of time. A study conducted in a Japanese hospital investigating the effect of cohort isolation of influenza patients and antiviral treatment showed a reduction in length of hospitalization (36).

Crowding is a fundamentally accepted risk factor in the transmission of infectious diseases, and administrative control measures have often focused on increasing space between individuals through an increased area around beds, “head-to-toe” sleeping, fabric or other barriers between beds, and cohorting.

Sleeping head-to-toe, which involves alternating bed arrangements so that troops sleep in a line of bunks alternating head and foot positions, increases the distance between breathing zones. Although data supported this practice are sparse, the practice seems logical and it does not involve additional resources (34).

f. Masks and personal protective equipment

During an influenza pandemic, surgical masks and respirators—along with other forms of personal protective equipment (e.g., gloves, gowns, and goggles)—should be used by health care personnel in health care settings in conjunction with standard droplet precautions, respiratory hygiene, cough etiquette, vaccination, and early diagnosis and treatment. Respirators (N-95 or higher) are recommended for use during activities that have a high likelihood of generating infectious respiratory aerosols. If supplies of N-95 (or higher) respirators are not available, surgical masks can help reduce virus transmission via large droplets, and should be worn during all health care activities performed near patients with confirmed or suspected influenza (37).

Masks were used as protective equipment during previous pandemics (38). In Asia during the SARS period, many people in the affected communities wore surgical masks when in public, and research suggested a lower incidence of SARS because of this (39, 40). But even so, mask use in a pandemic remains a focus of debate. Ordinary surgical masks do little to prevent inhalation of small droplets bearing influenza virus (10, 41) and data supporting the efficacy of N95 or surgical masks outside a healthcare setting are lacking. The use of N95 masks is further complicated by the need for fit-testing and the reports of discomfort after only an hour or two of use (42).

g. Engineering controls

Engineering controls are generally considered more reliable than other interventions since they do not require individual compliance or enforcement of administrative policies. Because the occurrence of respiratory disease is thought to be related to the amount of contagion in the air, engineering controls such as increased air dilution and ventilation, filtration, dust suppression, and air sterilization, may be of considerable benefit (34). However not all engineering controls are effective against influenza virus. For instance, four hours of ultraviolet light exposure was not effective in killing influenza virus (43).

CONCLUSIONS

The knowledge base used to develop guidelines for nonpharmaceutical interventions for influenza is limited and consists primarily of historical and contemporary observations rather than controlled studies evaluating interventions (44-48). During the 1918 Pandemic, some cities where nonpharmaceutical interventions were immediately implemented, especially St. Louis and San Francisco, had lower mortality rates. The public health interventions such as imposing restrictions on social gatherings, including closure of schools, churches, and theaters, where person-to-person transmission more readily occurs were thought to be relatively successful (49).

In summary, during a pandemic, frequent handwashing and respiratory hygiene/cough etiquette should be strongly encouraged among soldiers. Use of masks should be considered for those at highest risks of infection. Also, inexpensive and feasible administrative controls, such as cohorting, should be practiced to prevent the spread of disease. Head-to-toe sleeping is a “no-cost” intervention that should be utilized. Strong efforts should be made to reduce the crowding of military personnel. Finally, military planners should reduce the mixing of military cohorts with each other and with civilian populations.

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