

Managing Emerging Infectious Diseases: Should Travel Be the Fifth Vital Sign?

Trish M. Perl, MD, MSc, and Connie Savor Price, MD

The international community has witnessed the emergence of novel coronavirus-associated respiratory diseases, including severe acute respiratory syndrome (SARS) in 2002 to 2003 and Middle East respiratory syndrome (MERS) in 2012 to 2013. In 2014, Ebola emerged in western Africa, where it had not previously been seen. Now, 18 years after SARS, we are in the midst of an epidemic known as coronavirus disease 2019 (COVID-19), caused by the novel SARS coronavirus 2 (SARS-CoV-2). With these infections come significant morbidity and mortality, tremendous health care disruptions and resource use, and collateral economic and societal costs.

In the first 6 weeks of the current epidemic, the number of cases of COVID-19 has surpassed those of SARS and MERS during the course of those epidemics, raising questions about strategies to control the spread of infection. A major strategy has focused on “macro” public health responses, such as travel restrictions, public gathering and school closures, and city quarantines. However, experience with other respiratory viruses suggests that travel restrictions have a limited effect. Mateus and colleagues (1) found that such restrictions decreased new cases of influenza by only 3% and delayed but did not prevent influenza epidemics. Similarly, Errett and colleagues (2) identified minimal evidence to support the effectiveness of travel bans as a control measure for emerging infectious diseases. Read and colleagues (3) suggest that, because only 5% of infections have been identified, even a travel reduction that is 99% effective may reduce the epidemic outside Wuhan province by no more than 24.9%. Other investigators (4) estimate that almost 59 000 cases occurred in Wuhan and 3500 in other regions of China before the travel ban was implemented. Hence, the ban may simply reduce the progression of the outbreak by only 3 to 5 days within China. Finally, a recent report (5) suggests that 46% of cases would be missed by airport-based screening because of COVID-19’s incubation period, the spectrum of symptoms, and the time during the incubation period in which persons may fly. Available data specific to COVID-19 suggest that screening and restricting travelers may have a limited effect on containment.

Because travel interventions will not prevent transmission to new regions, vigilant infection control measures are critical: aggressive patient screening, active contact tracing, and isolation. Ebola, SARS, MERS, and COVID-19 all have nonspecific clinical presentations, but each emerged in a specific geographic area, and the epidemiologic links to these regions were key in guiding clinicians to implement proper barrier protections and patient evaluation. This led public health

agencies, including the World Health Organization and U.S. Centers for Disease Control and Prevention, to recommend a systematic approach to patients presenting with a relevant exposure and symptoms of an acute respiratory viral infection, such as SARS-CoV or MERS-CoV. Early recognition of potential cases was critical in limiting transmission by enabling enhanced prevention and control of infections and preemptive care. Mathematical models developed during the SARS and MERS outbreaks support the effectiveness of such strategies. Identifying patients with potential exposure or symptoms facilitated prompt isolation and, in health care settings, led to additional prevention and case-finding measures. Of note, it triggered health care personnel to use personal protective equipment, patient isolation, and hand hygiene. In the SARS outbreak, these measures prevented transmission of SARS-CoV even without the availability of effective vaccines and therapy. Indeed, these interventions have demonstrated superior efficacy over travel restrictions: Respiratory virus infections were reduced by 46% through hand hygiene, 77% through masks or respirators, and 32% to 33% through gowns and gloves (6).

Climate change, increasing global travel, and an evolving human-animal interface are likely to increase the frequency of novel infectious diseases. Although early identification of acute respiratory viral illness is key to trigger actions to interrupt the chain of transmission, it is often delayed. Surveillance systems using artificial intelligence are promising, as is more effective personal protective equipment, but patient vital signs are available now as powerful indicators of how quickly we need to intervene and what path to take.

Vital signs—temperature, heart rate, respiratory rate, and blood pressure—help us assess a patient’s health status, triage the patient to appropriate care, determine potential diagnoses, and predict recovery. Given the increasing frequency of emerging infectious diseases that are geographically linked, is it time to add a “fifth vital sign”? A simple, targeted travel history can help us put symptoms of infection in context and trigger us to take a more detailed history, do appropriate testing, and rapidly implement protective measures. An expanded set of vital signs may signal a lurking communicable infection and flag potential risks to health care personnel and other patients. Furthermore, electronic health records can integrate travel history with computerized decision support to suggest specific diagnoses in febrile returning travelers (7, 8).

The lessons from SARS, MERS, and Ebola tell us that early case identification is critical to protect both patients and those caring for them. In 2014, a patient

presented to a Dallas emergency department after returning from Liberia with low-grade fever, abdominal pain, dizziness, nausea, and headache (9). The patient had Ebola. Because clinicians did not obtain the 1 potentially distinguishing clinical clue—a travel history—patient and caregiver well-being was compromised.

All members of the health care team need training on how to integrate key epidemiologic information, such as travel history, into their risk assessments, in the same way they are trained to ask about tobacco exposure to assess risks for cancer and heart disease. They need a simple script to elicit clues for emerging infectious diseases and must be informed about current emerging pathogenic threats, such as COVID-19. Travel history could serve as a warning sign that prompts protective measures. Of course, we must implement such a change thoughtfully, with attention to unintended consequences—as shown by the inclusion of pain scores as a vital sign, which may have contributed to the opioid misuse crisis. However, we believe that the urgent threat of communicable diseases makes collection of travel history necessary. The current novel coronavirus is a troublesome reminder—on the heels of SARS, MERS, and Ebola—that national, regional, and institutional planning must learn from the past and remain vigilant and focused on vital measures to protect us all.

From University of Texas Southwestern Medical Center, Dallas, Texas (T.M.P.); and Denver Health and Hospital, Denver, and the University of Colorado School of Medicine, Aurora, Colorado (C.S.P.).

Acknowledgment: The authors thank James “Brad” Cutrell, MD, for his comments and suggestions.

Disclosures: Disclosures can be viewed at www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M20-0643.

Corresponding Author: Trish M. Perl, MD, MSc, University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard Y7.312, Dallas, TX 75390; e-mail, Trish.Pperl@UTSouthwestern.edu.

Current author addresses and author contributions are available at Annals.org.

Ann Intern Med. doi:10.7326/M20-0643

References

- Mateus AL, Otete HE, Beck CR, et al. Effectiveness of travel restrictions in the rapid containment of human influenza: a systematic review. *Bull World Health Organ.* 2014;92:868-80D. [PMID: 25552771] doi:10.2471/BLT.14.135590
- Errett NA, Sauer LM, Rutkow L. An integrative review of the limited evidence on international travel bans as an emerging infectious disease disaster control measure. *J Emerg Manag.* 2020;18:7-14. [PMID: 32031668] doi:10.5055/jem.2020.0446
- Read JM, Bridgen JRE, Cummings DAT, et al. Novel coronavirus 2019-nCoV: early estimation of epidemiological parameters and epidemic prediction. Preprint. Posted online 24 January 2020. medRxiv 20018549. doi:10.1101/2020.01.23.20018549
- Chinazzi M, Davis JT, Ajelli M, et al. The effect of travel restrictions on the spread of the 2019 novel coronavirus (2019-nCoV) outbreak. Preprint. Posted online 11 February 2020. medRxiv 20021261. doi:10.1101/2020.02.09.20021261
- Quilty BJ, Clifford S, CMMID nCoV Working Group, et al. Effectiveness of airport screening at detecting travellers infected with novel coronavirus (2019-nCoV). *Euro Surveill.* 2020;25. [PMID: 32046816] doi:10.2807/1560-7917.ES.2020.25.5.2000080
- Jefferson T, Del Mar CB, Dooley L, et al. Physical interventions to interrupt or reduce the spread of respiratory viruses. *Cochrane Database Syst Rev.* 2011;CD006207. [PMID: 21735402] doi:10.1002/14651858.CD006207.pub4
- Demeester RP, Bottieau E, Pini A, et al. Prospective multicenter evaluation of the expert system “KABISA TRAVEL” in diagnosing febrile illnesses occurring after a stay in the tropics. *J Travel Med.* 2011;18:386-94. [PMID: 22017714] doi:10.1111/j.1708-8305.2011.00566.x
- Edberg SC. Global Infectious Diseases and Epidemiology Network (GIDEON): a World Wide Web-based program for diagnosis and informatics in infectious diseases. *Clin Infect Dis.* 2005;40:123-6. [PMID: 15614701]
- Chung WM, Smith JC, Weil LM, et al. Active tracing and monitoring of contacts associated with the first cluster of Ebola in the United States. *Ann Intern Med.* 2015;163:164-73. [PMID: 26005809] doi:10.7326/M15-0968

Current Author Addresses: Dr. Perl: University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard Y7.312, Dallas, TX 75390.

Dr. Price: Denver Health and Hospital, 777 Bannock Street MC-2600, Denver, CO 80204.

Author Contributions: Conception and design: T.M. Perl, C.S. Price.

Drafting of the article: T.M. Perl, C.S. Price.

Critical revision of the article for important intellectual content: T.M. Perl, C.S. Price.

Final approval of the article: T.M. Perl, C.S. Price.

Administrative, technical, or logistic support: T.M. Perl, C.S. Price.

Collection and assembly of data: T.M. Perl, C.S. Price.