Temperature Screening to Prevent COVID-19 Transmission: Creating False Security

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Temperature screening mandates: grasping for straws
In the absence of effective test strategies, vaccines, and treatments, two common components of “reopening” strategies by many states include mandates for temperature screening and use of brief questionnaires to identify people with COVID-19 infection.

The idea is to prevent transmission by screening people as they enter (and in some scenarios leave) workplaces, stores, events, transportation hubs, and healthcare facilities. Methods used for temperature screening vary from touch and nontouch infrared (IR) thermometers to IR cameras for fast processing of people being screened. Most recently, even drones using IR technology have been proposed to screen crowds. Coupled with temperature taking is use of questionnaires asking individuals about their recent travels, contacts, and symptoms possibly related to COVID-19.

Inconsistent technique; environmental and human factors compound the problem
Accurately measuring body temperature in mass screening settings is challenging. A core body temperature of 100.4°F (38°C) or above is commonly considered a fever.

Traditional temperature-measurement devices (glass/mercury and electronic thermometers) come in contact with the patient’s body (under the tongue, in the rectum, or under the arm) and can be very accurate. Handheld IR thermometers measure a patient’s emitted thermal radiation from the ear canal (still using skin contact) or a noncontact device measuring the forehead skin. Results are fast—under five seconds.

IR cameras, also known as IR thermography, are also used to screen for fever in large numbers of people. These devices produce a thermal image on a video monitor and calculate body temperature based on skin temperature. A threshold temperature, such as 100.0°F, is selected as a cutoff for denying entry to an individual.

However, even the best devices properly used are only 90% accurate in detecting individuals with a fever, meaning 1 of 10 individuals with a fever would pass through the screening process. With SARS CoV 2, all it takes is one superspreader slipping through.

Huge holes in underlying theory
What we now know about SARS CoV 2 indicates temperature screening and questionnaires are a very problematic theory about how to reduce transmission. Here’s why:

Much of the population carrying the SARS CoV 2 virus never develops measurable signs or symptoms of disease but can still infect others. People who do become ill with COVID 19 can infect others for several days before signs and symptoms appear and after temperature has normalized in the recovery phase.
Enter human factors that affect measurement. Individuals conducting screenings—even healthcare workers—commonly use inconsistent technique. The possibility also exists that screened individuals may have taken a fever-reducing medication to evade detection to gain entry, such as to the workplace after a long hiatus.

Environmental factors add to the mix. Individuals’ movements and weather—heat or cold—can easily affect noncontact devices. Questionnaires have been used as an “extra layer” of protection. They elicit subjective responses, and those questioned may intentionally or unintentionally answer incorrectly.

So, scientifically and clinically, the theory of temperature screening and using questionnaires as an effective strategy to prevent transmission is wholly unsound.

The data: IR temperature scanning no better than chance

Studies have been performed on mass screening techniques during other infectious disease outbreaks and pandemics, such as Ebola, severe acute respiratory syndrome (SARS), and H1N1 influenza. Published studies and models using real-world data of these efforts in healthcare settings and at airports have reported very low detection rates—IR thermal scanner use was no better than chance (<50%). The primary problem is that many infected subjects have no fever. The authors of one study of airport screening for infection reported that even in a best-case scenario, almost two-thirds of infected travelers are not detected. And a very small fraction of infected travelers would self-report on a questionnaire during screening. Studies of individuals entering healthcare facilities who are screened with IR thermometers have reported fever detection rates, ranging from 24% to 93% for handheld devices and 57% to 91% for IR cameras. The fever detection rate also varies based on the threshold cutoff temperature and user experience.

Implications: Potential harms outweigh benefits

The harm is that relying on mass temperature screening and questionnaire strategies to prevent SARS CoV2 transmission produces a false sense of security, and people who got through screening may believe they are “safe.” However, if the strategy is ineffective because the underlying theory is flawed and the evidence shows it does not work, the potential harm accrues to everyone. Also, human and financial resources being allocated to this activity might be better used elsewhere.

How to proceed in the meantime

Use measures that do work. Travel restrictions to and from high-risk areas, social distancing in places where people congregate, aggressive hand hygiene, and 14-day quarantine of people with known exposure all work. Until the scientific and clinical communities gain more data that translates to knowledge about the virus, the disease, and immunity, we must avoid using ineffective strategies that may give the public a false sense of protection.

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