

The Threat of Ebola in the West

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The Ebola outbreak continues to raise the specter of pandemic as infections spread exponentially through western Africa. Meanwhile, public health officials in the West continue to assure the populace that a major outbreak in the developed world is unlikely. Aid workers are becoming infected at an alarming rate [1], but they are working in makeshift facilities with limited supplies, after all. With all the modern medical facilities the U.S. enjoys, suggesting that an outbreak is possible would only incite unnecessary panic, officials say. However, these same modern hospitals are themselves breeding grounds for deadly infections.

Hospital-acquired infections (HAIs) are picked up by patients while in medical facilities for unrelated care [2]. Patients undergoing medical treatment are often especially susceptible to assaults on their immune systems, and infection can spread from patient to patient by a number of means: on the unwashed hands of care providers, on contaminated equipment, contaminated clothing, or even through the air. Visiting family members and hospital staff are also susceptible to infection. CDC estimates range from 750,00 to 1.7 million individuals contract a HAI each year, resulting in 75,000 to 99,000 deaths [3,4]. European health agencies report comparable numbers [5]. Currently, the most deadly HAIs are caused by antibiotic-resistant bacteria like MRSA, but the norovirus, a viral pathogen like the organism that causes Ebola, can spread rapidly through hospitals.

Public health officials claim that even if Ebola made it to population centers in the West, established protocols would quickly contain it. Yet HAIs pose a continuing danger to patients in the U.S. and Europe. There is no mystery about how to stop the spread of infection in hospitals; strict adherence to basic procedures like thorough, frequent hand washing and proper sterilization or disposal of used equipment would go a long way towards reducing transmissions [6]. But incomplete adherence to basic preventative measures continues to allow HAIs to flourish. If health officials cannot control the spread of well-studied infections they see everyday, are they really prepared to face the exotic, virulent threat of Ebola?

Public health officials are also not accounting for the much more rapid and pervasive transportation that occurs in developed countries compared to the poor countries in Africa. The greater mobility of individuals may lead to much higher transmission and more rapid spread, competing with the effect of better hygiene (availability of water and soap), medical facilities and care. Any system will be overwhelmed by sufficiently many cases.

For the containment of both HAIs and Ebola, the solution is the same: a systemic approach that we at NECSI have advocated for years [7,8]. Conventional protocols focus on individuals and each point of contact, but they fail far too often in modern hospitals and are unlikely to even come close in Africa. The reason for this failure is that there are far too many contacts in a tightly linked network. To limit transmission in such a network the likelihood of transmission in each contact would have to be reduced to unrealistically tiny values. Just as NECSI described the need to reduce connectivity by network partitioning to limit transmission between groups and areas in Ebola-affected countries [9], a system of spatial partitioning in medical facilities would sharply limit transmissions [10,11].

Partitions are comparatively low in number and high leverage and therefore low cost interventions. The movements of doctors, nurses and other care providers through hospital wards should be controlled by gateways with enhanced disinfection protocols, in the same way as the movement of aid workers and civilians through areas of Ebola affected countries should be subject to gateways. A combination of partitions and individual controls is the essential approach to containing the movement of pathogens. As it stands now, hospitals and population centers are vulnerable to Ebola outbreaks---even in the West. There is no need for undue panic, but realism, and greater modesty on the part of public health officials, would leave us all better prepared to face this challenge.

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