

Outbreaks in Health Care Settings



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KEYWORDS

• Outbreaks • Health care settings • Sources of outbreaks • Evaluation • Review

KEY POINTS

- Outbreaks and pseudo-outbreaks that occur in health care settings should be approached systematically using advanced laboratory testing and epidemiologic tools to guide evaluation of events and to determine course of action.
- Multiple sources, such as health care personnel, the health care environment, supplies and equipment, and potable water, have been associated with outbreaks.
- Multiple organisms, such as atypical mycobacteria, *Acinetobacter*, *Pseudomonas*, *Staphylococcus aureus*, and carbapenem-resistant Enterobacteriaceae and fungal species have been associated with outbreaks in health care settings.
- Certain settings, including the neonatal intensive care unit, endoscopy, oncology, and transplant units, have specific issues that impact the approach to investigation and control of outbreaks in these settings.

OUTBREAKS

Health care settings, while providing a safe environment for patient care, are complex settings and can produce conditions that facilitate the transmission of organisms and outbreaks. First, patients are vulnerable hosts due to immunosuppressive conditions, disruptions of their skin and mucous membranes, medications, and extremes of age. Second, the facility design, the multitude of life-saving invasive procedures using complicated equipment, contamination of the hospital environment with organisms (including multidrug-resistant organisms), the close proximity of patients who harbor transmissible organisms, and frequent contact with health care personnel, who can themselves transmit organisms, can provide an ideal environment for the propagation of an infectious agent.

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As more health care delivery has shifted from acute care hospitals to outpatient settings and the population ages and more individuals reside in nursing homes, outbreaks are increasingly recognized in alternative settings. The risk factors identified in acute care hospitals are also present in other locations. The entire continuum of health care needs to be considered in assessing the epidemiology of an outbreak.

Outbreaks can be expensive and time-consuming and can cause significant disruptions in health care operations in addition to impacting patient morbidity and mortality. Twelve percent of published outbreaks have led to closures of medical units. The most common pathogens associated with unit closure were not highly resistant organisms but rather, viruses such as influenza and norovirus.¹ Rotavirus and severe acute respiratory syndrome (SARS) were also associated with high closure rates.¹ The greatest challenges in outbreak management are the delay in identification of an outbreak and the delay in determining the source of the outbreak. In 37% of published outbreaks, the source is not identified. When the source is identified, it can be traced back to patients (25.7%), medical equipment or devices (11.9%), the environment (11.6%), and the staff (10.9%).² Interestingly, the most common pathogens identified in outbreaks are *Staphylococcus aureus* (14.8%), *Pseudomonas* spp (8.9%), and *Klebsiella* spp (7.1%), and these organisms are rarely associated with unit closures.^{2,3}

APPROACH TO AN OUTBREAK

An outbreak is defined as an increase in events, such as infections or number of organisms above the baseline rate, for a geographic area during a specified period of time. Some experts use a statistical definition. This increase may be a single infection, as in the cases of anthrax, health care-associated *Legionella*, or group A Streptococcal infection, or it may be many infections. The increase may occur over a short period of time or over years and may occur in a single unit or across many hospitals. Evaluating and managing outbreaks can be complex and multifaceted and often multiple steps occur concurrently. In any setting, the investigation should be efficient, thoughtful, and systematic so that appropriate infection prevention processes can be implemented to protect patients and health care personnel (**Box 1**).

Initially, it is important to verify the diagnosis. A varicella rash may be confused with smallpox or a culture may have been misread. Verification may require additional laboratory testing or clinical evaluation. It is, also, essential to communicate with the laboratory to save specimens early on in the investigation. These specimens can be used to identify a common source, trace transmission patterns, or reveal that a perceived outbreak was a cluster of unrelated events. Once the diagnosis has been confirmed, and the laboratory has been notified, a line list is created to describe potential cases with regard to person, place, and time. This is used to help focus the investigation. Simultaneously, it is important to determine if the baseline rate of the organism or infection of interest has changed over time, keeping in mind seasonal variation and comparing equivalent seasons. Such assessments must consider and ensure that other factors are not leading to the newly identified increase to accurately ascertain if there is a “true” increase in the rate of interest. A change in rates could result from altered surveillance definitions (changes in the numerator) or changes in the patient population sampled (changes in the denominator). As this assessment process is occurring, other cases should be identified, which may involve broadening the numbers and types of patients tested.

Once it has been determined that the observed infections represent an increase above baseline, the next step in investigating an outbreak is to create a case definition. This definition should be broad enough to capture any potential cases that may have

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