Monitoring Major Illness in Health Care Workers and Hospital Staff

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(See the brief report by Seto et al, on pages 280–283.)

During the past 3 decades, our understanding of both the biology and epidemiology of infectious diseases has vastly improved because of methodological and technological developments. However, researchers have yet to take full advantage of the tools available to them, particularly in health care settings. Most studies of nosocomial influenza and other infections focus primarily on patients, but health care workers (HCWs) [1–3] and hospitals [4] are likely to be central to disease transmission, prevention, and risk. Unfortunately, most studies of disease transmission within hospitals treat HCWs as “fixtures” rather than dynamic members of a disease transmission network, and there has been inadequate investment in the study of disease transmission among HCWs. This is a missed opportunity to develop a critical understanding of disease epidemiology, thereby increasing patient safety and supporting and protecting HCWs as one of society’s most important and valued resources.

The study in this month’s Clinical Infectious Diseases by Seto and colleagues highlights the importance of detailed surveillance and research of infectious diseases among HCWs in understanding the roles of HCWs and patients in nosocomial transmission. It demonstrates the value of an organizational ability to adopt and integrate innovative methods into hospital procedures, and also some missed opportunities to gain a more complete understanding of the observations.

SURVEILLANCE OF ILLNESS IN HEALTH CARE WORKERS POPULATIONS

An area in need of urgent attention is surveillance of infectious diseases among HCWs, which was magnified by the severe acute respiratory syndrome epidemic [5]. Although the dearth of surveillance in this population persists, recognition of the utility and value of collecting such data is beginning to emerge. Seto et al report on an impressive system of monitoring and surveillance of all hospital and clinic staff in 38 hospitals and 74 outpatient departments for pandemic influenza A (pH1N1) in Hong Kong. Although the complete compliance observed in this study may not be achievable in other health care settings—because such rigorous follow-up may be too resource intensive, and participants in research studies have the autonomy to opt out—methods for analyzing incomplete data are available [6].

The article by Seto and colleagues suggests that hospital staff have influenza-like illness (ILI) patterns, as observed in any population, and become infected not only by their patients, but also by community members and co-workers. Regular monitoring of staff ILI, and perhaps other infectious disease symptoms (ie, syndromic surveillance), could provide key information for critical workforce planning for epidemics and seasonal illness. The impact of ILI monitoring in such settings is amplified by extremely large workforces in many countries, owing to a single joined health care system or coordinated data reporting of the workforce of the health care system surveillance of such large populations may also enable early identification of outbreaks with real-time outbreak detection methods that are common in larger national ILI surveillance systems [7]. Such monitoring, in combination with properly designed and evaluated simple questionnaires, could be an inexpensive and effective way to provide information on disease transmission and prevention within health care settings and could provide early warning for unusual disease presentation, patterns, or staffing needs.
To decrease expense and increase efficiency and compliance, such surveillance could be embedded in or linked with existing processes within the health care setting. The very nature of a workforce provides a “controlled” situation for improving understanding of influenza transmission risk, given the pseudo-closed cohort and large numbers of staff within health care settings. Such monitoring, in conjunction with monitoring of vaccination uptake, can help establish an evidence base for epidemic actions and vaccination policies within health care settings.

Routine surveillance of HCW illness could also inform epidemic monitoring activities including “scale-up” protocols for extreme events. Use of infection control officers and nurses to ensure compliance and near complete data collection, as described by Seto et al, was an efficient and effective shift in infection control activities that allowed identification and documentation of pH1N1 cases among staff. At the same time, it demonstrates the need to develop or maintain infrastructure and resources in occupational health and infection control to enable protection of patients and staff, collection of important scientific information, and informing management of the situation. While Seto and colleagues’ methods are suggestive of a time-consuming and expensive process that may not be sustainable outside of an epidemic or pandemic, such methods could be reserved for extreme events that provide rare but rich data, such as epidemics, particularly of new influenza strains, with escalation to increased data collection informed by inexpensive, basic surveillance.

USING INNOVATIVE METHODOLOGIES AND TECHNOLOGIES

Although the monitoring of symptoms and confirmatory testing can provide important information, they provide a limited, generalized epidemiologic perspective on the situation. One of the most interesting findings by Seto et al is that more pH1N1-infected HCWs reported being in contact with sick colleagues and community members rather than patients. Although challenging the supposed dogma that HCWs contract disease from patients during nosocomial transmission, this finding unfortunately still requires scientific evidence to confirm the source of transmission.

**Molecular Epidemiology**

Our lack of ability to reasonably predict disease transmission events from likely exposure using standard epidemiologic procedures is highlighted in molecular epidemiology studies. Molecular studies of human immunodeficiency virus (HIV) infection in sexual partners reveal that individuals may poorly identify their source of HIV infection [8, 9]. In respiratory illnesses, which can be transmitted from an unnoticed stranger, we often rely on known or probable exposures, such as those reported by HCWs in the study by Seto et al. However, epidemiologic examination of pH1N1 influenza transmission among college students, including phylogenetic analyses, revealed that those who had significant exposure to one another (ie, lived together) and similar onset of illness, suggesting epidemiologically related cases, infrequently shared a related pH1N1 virus [10]; this demonstrates the need for molecular epidemiology, and not just reported exposure, to confirm the source of transmission in influenza infection.

Although it is interesting that a high proportion of HCWs in the study by Seto and colleagues recalled a colleague with pH1N1 influenza, little is known about what may be contributing to this recall. Lack of molecular data prevents further investigation into how recall of exposure relates to acquisition, which would be an extremely original area of study. In a health care setting, the expense of full genome sequencing for molecular epidemiology may exceed reasonable costs for confirmatory testing, emphasizing the importance of banking samples for future research and collaboration, because such data could expand our understanding of the role of hospitals and staff in disease transmission networks. It is most impressive, however, that Seto et al report confirmatory pH1N1 testing among hospital staff with ILL, as biologic testing of HCWs is unfortunately often not considered in studies of disease transmission in hospitals.

**Network-Level Analyses**

In addition to molecular analyses, there is increasing recognition that prevention must take into account transmission networks and behaviors. Research into HIV and sexually transmitted infections first demonstrated the importance of understanding disease transmission networks [11], and the network concept is now in its nascent stages for informing community transmissible [12, 13] and hospital infections [1, 14]. Although these recent studies of community and hospital transmission suggest how contact networks may structure disease transmission, they have generally not considered disease outcomes, in part because transmission is relatively rare in populations of HCWs. It is therefore critical to have preexisting “research preparedness” strategies to take advantage of the opportunities to learn from events, such as identification of pandemic infection and control activities in HCWs, as described by Seto et al, combined with use network measures, such as spatial-temporal contact frequency and duration.

Understanding how job structure, environment, contact networks, and movement facilitate disease transmission among HCWs and their patients and colleagues is critical in light of the report by Seto et al and dramatic shifts in work patterns that occur during epidemics. Such information would provide the
evidence base needed for workforce planning, epidemic response, and management structure within hospitals with respect to patient and HCW safety.

“REAL-TIME” AND PREPARATIVE RESEARCH STUDIES

Preparation in design of data collection and its maintenance before extreme events can ensure both a more rapid response to the problem at hand and the data to assist in understanding the best prevention responses. Given that HCWs are a well-defined and easily enumerated population whose movement is often significantly structured by work activities, they are an ideal observational population in which to study the dynamics of influenza transmission. It is therefore critical to engage methodological specialists, frontline clinicians, and managers (eg, workforce planning, human resources, occupational health) prior to epidemic events in order to capture complete and informative data for thorough analyses.

The need for advanced preparation and investment of resources into the study of outbreaks before their occurrence is further emphasized by the potential barriers that might otherwise be faced. Ethical approval may not be in place at the time of an epidemic or outbreak and hospital policy or approval procedures may delay data collection considerably, owing to the focus on the emergency. Our ability to collect much-needed data and thus increase our understanding of disease transmission and prevention would be greatly extended by establishing preapproved procedures, including ethical approval, basic data collection, and storage arrangements for biologic samples, to employ in the event of an outbreak or epidemic, which is detected by an effective yet inexpensive early warning system.

Learning From Extreme Events
Extreme events, such as the severe acute respiratory syndrome and influenza pandemics, serve as a solemn reminder of the need to monitor illness and to conduct high-quality research among HCWs and hospital or clinic staff. Understanding factors driving staff-to-staff, patient-to-staff, staff-to-patient and patient-to-patient disease transmission in health care settings is essential for controlling epidemics and ensuring patient and staff safety. Research and surveillance of disease transmission and prevention among staff in health care settings can be incorporated into existing hospital systems and collected seamlessly and ethically with early planning and protocol development. It is critical that clinicians and researchers strive to raise the bar for research on disease transmission among HCWs. Use of modern methods, analytic techniques, and technologies, such as molecular and network analyses, and inclusion of experts from multiple disciplines are key to expanding our understanding of disease transmission and prevention and improving medical practice and policy.

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