



Major article

Infection preventionists' awareness of and engagement in health information exchange to improve public health surveillance

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Background: Advances in electronic health record (EHR) systems and health information exchange (HIE) are shifting efforts in public health toward greater use of information systems to automate notifiable disease surveillance. Little is known about infection preventionists' (IPs) awareness, adoption, and use of these technologies to report information to public health.

Methods: To measure awareness and engagement in EHR and HIE activities, an online survey of IPs was conducted in states with HIE networks. A total of 63 IPs was invited to participate; 44 IPs (69%) responded. The survey asked about the adoption and use of EHR systems, participation in regional HIE initiatives, and IP needs with respect to EHR systems and public health reporting.

Results: Over 70% of responding IPs reported access to an EHR system, but less than 20% of IPs with access to an EHR reported being involved in the design, selection, or implementation of the system. Just 10% of IPs reported that their organizations were formally engaged in HIE activities, and 49% were unaware of organizational involvement in HIE. IPs expressed a desire for better decision support, paperless reporting methods, and situational awareness of community outbreaks.

Conclusion: Many IPs lack awareness and engagement in EHR and HIE activities, which may limit IPs ability to influence or utilize key information technologies as they are implemented in health care organizations.

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Surveillance is a core function of public health agencies that requires timely, accurate, and complete data.^{1,2} The practice of surveillance is largely focused on notifiable diseases, those for which information regarding individual cases is necessary to prevent and control disease.³ Unfortunately, many notifiable diseases are reported less than half the time,⁴ and the time lag between diagnosis and submission for those reported to public health can be as high as 3 weeks.⁵ Underreporting and delayed reporting hampers public health agencies' efforts to monitor and intervene in the spread of harmful, and sometimes fatal, conditions such as bacterial meningitis, pertussis, and Lyme disease.

Advances in health information technologies, including but not limited to electronic health record (EHR) systems, electronic laboratory reporting (ELR), and health information exchange (HIE), have shifted public health efforts toward greater use of information systems and networks to automate disease reporting and surveillance.^{1,4} Historically, public health agencies have relied on physicians and infection preventionists (IPs) to manually, spontaneously report notifiable diseases following diagnosis, usually after receiving a confirmatory laboratory test result. In the recent past, several studies in public health informatics have successfully demonstrated that less manual, more automated approaches like ELR, which utilize EHR systems and HIE networks, can improve the completeness and timeliness of notifiable disease surveillance efforts.⁵⁻⁹

Despite more than a decade of promising research, no state health department receives 100% of its notifiable laboratory reports using ELR.¹⁰ To spur adoption and use of EHR systems and HIE networks for ELR, the US Centers for Medicare and Medicaid

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Services (CMS) is requiring hospitals that wish to receive stage 2 “meaningful use” payments to electronically report laboratory data for notifiable diseases to public health.¹¹ Furthermore, the Office of the National Coordinator for Health Information Technology is providing nearly \$500 million to develop HIE networks within US states and territories.¹²

HIE is the electronic transfer of clinical and administrative information across diverse and often competing health care organizations.¹³ HIE has the potential to improve the safety and cost of health care delivery. For example, delivering the right information to the right person at the right time using HIE networks has the potential to reduce up to 18% of patient safety errors generally and as many as 70% of preventable adverse drug events across the care continuum.¹⁴ Information exchange further has the potential to reduce health care costs in the United States by as much as \$78 billion through a reduction in unnecessary medical tests and procedures by improving communication about patients’ latest medication regimens, laboratory test results, and diagnostic procedures.¹⁵

HIE also has the potential to improve infection control practice. For example, Kho et al found that, across a large metropolitan area, 286 unique patients generated 587 admissions accounting for 4,335 inpatient-days where the receiving hospital was not aware of the prior history of methicillin-resistant *Staphylococcus aureus* (MRSA).¹⁶ These patients accounted for an additional 10% of MRSA admissions received by study hospitals over 1 year and over 3,600 inpatient-days without contact isolation. To improve awareness of patients who should be in contact isolation, Kho et al implemented a clinical reminder using HIE to alert IPs when patients who had a history of MRSA were admitted to their facilities.^{17,18} In the first year, the HIE delivered 2,698 admission alerts for patients with a history of MRSA, one-fifth of which (19%) were based on data from a different institution.

The adoption and use of EHR systems and HIE also provides an opportunity to address redundant and variable reporting mechanisms that make notifiable disease reporting inefficient. In a 2009 survey of IPs by the Association for Prevention in Infection Control and Epidemiology, Inc (APIC), respondents indicated that redundancy in reporting to public health prevents IPs from performing other job duties, including organizational surveillance, infection control interventions, and disease prevention strategies.¹⁹ A 2011 survey of IPs by APIC to identify research priorities ranked developing and evaluating hospital information systems for surveillance as highly important.²⁰ These sentiments indicate that IPs are strongly interested in leveraging their organizations’ adoption and use of information technologies to improve efficiencies in surveillance activities, including notifiable disease reporting processes.

Several studies have examined physician, nurse, and hospital executive perceptions of and engagement in the adoption and implementation of EHR systems and HIE networks.^{21–26} We found no studies, however, that specifically examine IP perceptions of and engagement in EHR and HIE technology adoption and implementation to improve surveillance of notifiable disease, a core function of public health and IP practice. Therefore, we surveyed IPs to examine their awareness and use of EHR systems as well as HIE to improve notifiable disease reporting processes.

METHODS

To measure awareness, perceptions, and engagement related to EHR and HIE activities, an online survey of IPs was conducted in late 2010. The survey asked respondents to indicate their organizations’ adoption and use of EHR systems as well as participation in regional HIE initiatives. Respondents were further asked to provide their perceptions of the data and information available through EHR

systems and HIE networks for notifiable disease reporting to public health agencies. Finally, the survey asked respondents to comment on their needs with respect to EHR and public health reporting.

Participants

The survey targeted hospital-based IPs given their role in gathering and reporting information to public health agencies regarding notifiable disease cases. Participants were drawn from select, purposefully chosen US states. Three of the states (Indiana, Washington, and Idaho) were presumed to have IPs with direct knowledge of HIE initiatives because the state health departments and HIEs in those states received US Centers for Disease Control and Prevention funding in the prior 2 years for enhancing public health practice using HIE.²⁷ The other states (Florida, Nebraska, and New Mexico) were presumed to possess IPs with awareness of HIEs given the maturity of HIE initiatives in those states but whom may not be engaged in enhanced notifiable disease surveillance activities using an HIE. Prior to including a state in the study, the lead author examined background information on the HIEs operating in the state including support for public health surveillance. Our goal was to balance states with active public health engagement with states where public health was not necessarily engaged in HIE activities.

Sixty-three IPs were invited via e-mail to participate in the survey. Using a variety of controlled vocabulary terms, including “infection control professional” and “CIC infection control,” names and e-mail addresses for IPs who serve as APIC chapter leaders, speakers at APIC-sponsored events, and IPs who were first authors of peer-reviewed articles were obtained. Each individual on the final list received an invitation to take the survey. APIC chapter leaders were encouraged to share the survey invite with their membership. The sample was designed to be diverse and draw a roughly equal number of participants from each target state. Invitees received reminder e-mails every 3 to 4 weeks.

Survey development

A Likert-type survey instrument was developed using model questions drawn from a number of recent surveys used in public health and informatics studies.^{28–31} Additional questions were developed to capture data on current public health surveillance activities; the relationships between the respondents and nearby HIEs; and the attitudes toward EHR and HIE data completeness, timeliness, and usefulness.

The initial surveys were pilot tested by IPs working in the selected states and otherwise eligible to complete the survey. Pilot testers were asked to complete the draft survey and identify questions or terms that were ambiguous or inappropriate. Their feedback was used to modify the survey prior to distribution to the sample population.

Analysis of survey data

The survey data were principally analyzed using descriptive statistics. We developed a codebook for the portions of the data that were qualitative in nature using themes from the study including timeliness, completeness, interoperability, satisfaction, and usefulness. The codebook was used to categorize respondent’s open-ended responses into similar themes that could be easily summarized.

The survey was conducted as a component of the lead author’s dissertation.³² The study was approved by the Institutional Review Board of Indiana University–Purdue University Indianapolis (study No. EX1010-14). The survey instrument and codebook are available

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