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Using Information Systems to Improve a Mid-Sized Local Health Department's Effectiveness in a Time of Rapid Change

Kay Lovelace, PhD, MPH; Gulzar H. Shah, PhD, MStat, MS

Background: Informatics capacity building is resource and personnel intensive. Many local health departments (LHDs) face tradeoffs between using their resources to carry out existing mandates and using resources to build their capacity, for example, through informatics, to deliver essential services in a more effective and efficient manner. **Objective:** The purpose of this case study is to describe how a mid-sized LHD built and used information systems to support its strategic objectives, clinical services, and surveillance. **Methods:** The mid-sized LHD described here was chosen for its "best practices" in informatics capacity building and use by NACCHO's study advisory committee. To conduct the case study, authors reviewed departmental documents and conducted semistructured interviews with key informants in the agency. Interviews were recorded, transcribed, thematically coded, and analyzed.

Results and Conclusions: Findings from the case study suggest that including capacity building in informatics as a strategic priority is one of the most effective ways to ensure that informatics are assessed, updated, and included in resource decisions. Leadership at all levels is critical to the successful implementation of informatics as is proactive partnership with community partners who have overlapping goals. The efficiency and effectiveness of LHDs rely on informatics capacity, especially when resources are challenged.

KEY WORDS: electronic health records, informatics capacity, performance management, quality improvement, strategic planning, surveillance

This case study examines how a mid-sized local health department (LHD) is dealing with information

management challenges faced by public health agencies nationwide. Local health departments are operating after the recession in an environment marked by reduced budgets, fewer employees, and increasing demands for innovation and quality improvement.¹ Requirements for advanced public health informatics have emerged from several normative trends and developments such as cross-jurisdictional sharing and better care coordination for clinical services,² the Affordable Care Act,³ emergency preparedness needs,^{4,5} and pursuit of accreditation through the Public Health Accreditation Board (PHAB).^{6,7} PHAB accreditation requires routinizing community health assessments,⁸ community health improvement planning,³ agency-wide quality improvement,⁹ communication and data exchange with community partners, and evidence-based decision making.⁸ Emergency preparedness, post-H1N1 and 9/11, requires LHDs to build disease and biosurveillance capacity in order to identify and neutralize new and emerging threats before they materialize or reach their full potential.^{4,5}

Roughly 3 out of 10 LHD services are personal health care services.¹⁰ Under the Health Insurance Portability and Accountability Act (HIPAA) of 1996 and the

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The authors declare no conflicts of interest.

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Health Information Technology for Economic and Clinical Health Act (HITECH) of 2009, LHDs are expected to facilitate patient care coordination by using electronic health records (EHRs) and by sharing their EHR data through health information exchanges (HIEs).¹¹ HIPPA authorized public health authorities to receive and report EHR data for public health uses such as preventing or controlling disease, injury, or disability; reporting health events; and conducting public health surveillance, investigations, and interventions.¹¹ HITECH established funding for states to help develop HIEs to transmit EHR data among health care providers, Medicare, Medicaid, and public health agencies.¹¹

EHRs and HIEs are expected to enable the timely exchange of accurate data, eventually leading to improved population health outcomes.¹² However, barriers to EHR implementation in LHDs are abundant and challenging to overcome.^{13,14} Without interoperable information systems and EHRs, LHDs face limitations including decreased efficiency and ability to electronically exchange health information.¹⁵⁻¹⁷ Including informatics capacity building in strategic plans and priorities of LHDs is also critical for ensuring ample resource allocation for informatics.¹⁸ Qualitative studies illustrating how LHDs use information, analytics, computer science, and IT to support public health functions and services and the barriers and facilitators of their use are scant. This case study provides an example to bridge that gap.

● Methods

As part of the 2015 NACCHO Informatics Capacity and Needs Assessment Study of LHDs, 3 case studies were completed with LHDs to understand how they implemented/used information systems to support public health functions. We explored factors, that were not available in the NACCHO study's survey data, that may be associated with LHDs' adoption and use of informatics.

Site selection

The NACCHO informatics team and the study advisory group, composed of national public health informatics experts, identified LHDs known for their use of information and information systems to improve public health and that were part of the survey sample. For the study, we chose 1 LHD from a small- and 2 LHDs from medium-sized jurisdictions.

Interview questions

We defined public health informatics as the systematic application of information, analytics, computer

science, and technology to support the day-to-day work of public health and to improve public health practice, research, and education.¹⁹ It is both the IT infrastructure and how information is used in public health work. With input from the study advisory group, the 2 investigators adapted questions from a previous implementation study of public health informatics.²⁰ Final questions were organized into 6 topic areas: (1) the role of the interviewee regarding development and use of the LHD's information systems, (2) history of informatics implementation, (3) use of information systems and databases, (4) successes and challenges in the implementation and use of informatics, (5) the value of informatics to the health department and the community, and (6) lessons for other health departments. The study and interview protocols were reviewed and approved by the Georgia Southern University Institutional Review Board.

Procedure

In each LHD, we reviewed Website documents and conducted interviews with persons responsible for informatics capacity development and use. Interviewees' potential roles included the health director/department administrator, the Information Systems (IS) manager, a clinical and/or epidemiology program director, and an office administrator. In May-June 2015, the first author conducted and digitally recorded 1-hour telephone interviews with 3 to 4 key informants from each LHD. Interviews were coded with NVivo 10 software using the question topics listed previously as codes; the text was also marked with these codes whenever these topics arose in the discussion. Interviewees provided more information when needed and reviewed initial reports for accuracy.

The agency described here is a medium-sized jurisdiction LHD in a decentralized state public health system. It uses informatics extensively to improve the work of public health. The first author interviewed the health director, an epidemiologist, an IS manager, and a clinic director.

● Findings

Site description

The LHD participating in this case study is PHAB-accredited, and serves a population jurisdiction of about 500 000 people with a budget of approximately \$13.5 million and 150 full-time equivalent employees (FTEs). It is governed by a 5-member board of county commissioners. Its services include health planning, performance improvement, health promotion, clinical services, immunizations, family planning, cancer

prevention, Healthy Start, children's dental services, WIC, TB control, STI control, and emergency preparedness. Information technology support consists of a senior administrative officer and several additional staff members who provide support to the agency and other county departments. The agency uses information systems for a variety of functions including strategic planning, performance management, clinical services, real-time syndromic surveillance of emergency department visits, and emergency medical service calls, and for state surveillance systems (see the Table for more detail). Here, we discuss 3 specific applications of information systems/tools: an online strategic/program planning tool, EHRs and their implementation process, and the use of data systems for surveillance.

Using information systems to enhance strategic planning and monitor strategic objectives

Strategic planning is a PHAB requirement and these processes are useful only if they are living guides to an agency's work rather than "once and done." An online planning tool for strategic and program planning

has been instrumental in this agency's efforts to understand what can be learned from the multiple information systems they maintain: "we use it for our performance management system; it's where all of our strategic plans, strategic priorities, and key performance indicators are." Each quarter, program managers and key employees use the online planning tool as they meet to review progress on programmatic and strategic objectives. In each review, managers answer these questions:

What challenges do you have? What have you implemented to overcome these challenges? What have you had to do to be able to meet your [performance indicators]? What possible QI projects do you see based on this last quarter? Are there any opportunities for research? Or collaboration?

These data reviews are used to improve community health. Analyzing the dental clinic's school screening data enabled staff members to identify and target interventions to schools with the highest prevalence of untreated tooth decay. To bring professionalism to program evaluation, the agency hired a postdoctoral student who also trains other staff members in evaluation methods.

TABLE ● Information Systems and Data Used on a Daily Basis

Information systems

Information systems for clinical services:

- PHClinic, an electronic medical record (not connected to an HIE) that is also used for billing
- A data system for the Healthy Babies Program
- The data system for the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
- WebIZ, the state immunization registry

Hospital emergency department and fire surveillance in real time

The state health information exchange

The state electronic disease surveillance system that allows local, state, and federal agencies to identify, investigate, and mitigate communicable diseases, environmental hazards, and bioterrorism events. The system supports electronic laboratory reporting and reporting of contact and case information.

CDC Evaluation Web—collects HIV testing information

The state county health status indicators Web site

A comprehensive, online strategic planning tool

Data

Communicable disease data

Food safety and outbreak data

Air quality, water quality, childcare licensing

Health equity and disparities data (limited)

Emergency preparedness data

Maternal and child health (MCH) data

Sexually-transmitted infection (STI) data

Vital records

Youth Risk Behavior Survey (YRBS)

Behavioral risk factor surveillance system (BRFSS)

School absenteeism data

Autopsy data

Program evaluation data

Abbreviations: BRFSS; CDC, Centers for Disease Control and Prevention; HIE, health information exchange; MCH; STD; WIC; YRBS.

Several of the agency's strategic objectives explicitly address adopting information systems. In 2012, the agency developed strategic objectives to transition to Meaningful Use of EHRs and to connect with an HIE. Achieving these objectives would facilitate the agency's compliance with HIPPA and HITECH standards and would allow the agency to use the information gained through the exchange for surveillance and monitoring, conducting public health investigations, and developing interventions.

Transition to EHRs

The current clinic management software program used by the agency, PHClinic, which is used widely by LHDs, does not connect to an HIE; therefore, it does not meet the Office of the National Coordinator certification standards for an EHR. Staff members reported that the current record system is outdated (medical charts are kept in paper form), and there is a waiting period to obtain information that is sometimes needed in a timely manner. Only some of the multiple information systems are interoperable, resulting in some duplication of data entry efforts across systems. For example, there is an online disease-reporting form for local practitioners to use, but the information does not automatically go into the disease-reporting software or the communicable disease/environmental hazard surveillance reporting system, and certain staff have to enter case management information into both PHClinic and the surveillance system. In addition, the department has had issues with connectivity and speed of the network using PHClinic.

Still, PHClinic has been used by the agency since the nineties to track client information, schedule appointments, create encounters, record services, and bill. It is now used by about half of the staff on a regular basis and contains detailed information about each client—demographics, family, income, address, guarantor, services, and billing. It has quasi-HIE connections to the state HIE and to the state immunization registry. Through the immunization registry, the department is able to batch query for existing clients' histories, update the registry, and save immunization information back to client records.

Finding a clinic software program that would address issues with the current system, meet the objectives of EHR development, and provide complete interoperability with relevant systems required a deliberate and lengthy process. For several years, the agency researched the feasibility of changing clinic software and then investigated different options. The agency selected an open-source comprehensive, ambulatory, Meaningful Use-certified EHR system available to LHDs. The IS manager reported:

We've spent a lot of time analyzing our work processes and seeing how we do things and realizing that moving to an electronic medical system is going to drastically change the way we're doing business. It's going to be a whole new ballgame for us.

Because some clinical staff members have worked in private offices, they understand how EHRs can allow clinicians to look at previous patient encounters, see test results, and avoid duplicating services. However, a learning curve is expected with some of the staff members. This learning curve has been intensified by the different user interfaces for different departmental systems and the need to get all of these records into the EHR system. The agency director and upper administration have led, supported, and encouraged this transition, encouraging staff members to accept its validity.

Another challenge is concern about the confidentiality of patient data kept in the cloud. As of June 2015, the board had not approved the EHR's real-time connection to the state HIE. To build an efficiency argument, a departmental epidemiologist undertook a time study of the use of the HIE to complete notifiable disease investigations. She found that the average time to access initial patient information using traditional methods (phone call or fax) was 13 hours compared to 6 minutes using the HIE. The department has used these data, anecdotal accounts of patient encounters, and support from county physicians to dialogue with the board about the benefits of being connected to the HIE.

Using surveillance and environmental health data to address emerging problems

The agency described here has an active surveillance and epidemiology program where it collects, analyzes, and uses data to control communicable diseases such as West Nile. Working with the state department of health, the department has tracked mosquito trap numbers and used this information to provide directed messages about the protective actions to avoid bites. An enhanced program with 9 traps in the jurisdiction was started in 2013; since then the jurisdiction's number of West Nile cases has decreased while cases have increased in other areas of the state.

In another instance, a departmental epidemiologist quickly found information about a positive whooping cough laboratory test through the use of the state disease investigation HIE. The epidemiologist determined that the infant was in the hospital and notified hospital staff before they received the test result from the laboratory, resulting in quicker treatment of the infant and less exposure for the staff.

One recent innovation was building an enhanced school surveillance system for absenteeism and disease

reporting. Each school nurse has a password to enter data on a daily basis and get an on-demand report of countywide school absenteeism and district data. The department expects that this system will be effective in quickly identifying a large outbreak.

● Discussion and Additional Lessons

A limitation of this case study is that it is based on interview and reports (such as strategic plans) available through the Website. Ideally, these findings could have been triangulated with data from onsite visits and additional observations. Still there is much to learn from the work of this LHD to implement informatics in their day-to-day work.

Including informatics in *strategic objectives*, as this department did, is arguably one of the most effective ways to ensure that the agency's capacity to adopt and use information systems is assessed and updated within the resource limitations.¹⁸ Systematically *evaluating the department's needs* helped make a case for informatics as a strategic issue. *Including informatics capacity building* among the agency's strategic priorities also ensured that formal leadership support was pledged, appropriate funds were allocated, and the proper hardware, software, and staff expertise are available to meet the needs of LHD programs and functions.

The director strongly believes that staff burden can be reduced through the effective use of information systems and tools. Success is partially attributable to the health director's advocacy for the strategic use of informatics. In addition, leaders at all levels, from the director to the epidemiologist to the senior technology administrator to clinic employees, have facilitated the development and use of information systems. These leaders have been aware of the importance of being strategic, patient, and flexible. For example, the transition to the EHR has been longer than expected.

We wanted to go through this process a year ago and it's just taken longer to get to the point where we're at now. There are lots of hurdles [and processes] to work through to get there. It's just going to take a lot more time than we realized that it would. So I think just a lot of patience and flexibility [is needed]. We've had some staff turnover which means we've had new people to involve, so it's been a huge process.

Proactive engagement with other community partners with overlapping goals has also been instrumental in the agency's development of informatics capacity. A group of county physicians and the dean of a nearby medical school have lent political support for the EHR system. Students from the medical school and a local university regularly work with the department in the clinics and conduct special projects with the epi-

demologists. One is working on her master's degree in Nursing in Informatics. Three agency employees attended an 8-week online public health informatics institute course as a team. Serving on a state informatics task force has enabled an epidemiologist to network with the state and other LHDs. Hiring a post doc has allowed the department to collect and utilize evaluation data and thus keep better track of the impact that they are having in the community. The county informatics department has provided support to the agency as it builds and transitions information systems.

Solidifying the department's capacity to use and benefit from information systems will continue to be critical. In 2015, the departmental budget was cut by approximately 4%. With these cuts, the efficiency and effectiveness that informatics capacity provides will be necessary for the department to deliver the high-quality public health services for which it is known.

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