Shifting the Paradigm of Infection Surveillance and Prevention in the Era of Ebola: Lessons Learned from Healthcare-Associated Infections

Daniel A. Pollock, M.D.
Surveillance Branch Chief
Division of Healthcare Quality Promotion
National Center for Emerging and Zoonotic Infectious Diseases

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CDC’s System for Healthcare-Associated Infection (HAI) Surveillance

- A single system for U.S. healthcare facilities to report infections and other adverse healthcare events to CDC
- NHSN’s centralized IT infrastructure enables thousands of reporters in the clinical sector to submit data to a single public health node, using a web interface or electronic messages
- Data reported to NHSN is made immediately accessible via secure connections with multiple state public health agencies
- NHSN—or a similar network—could fulfill the need for a scalable, everyday system that can be expanded to meet additional surveillance requirements in an epidemic
Information and Ideas for this Presentation: Naming the Original Sources

Pam Belluck  
Albert Camus  
Philip Caper  
Bernice Dahn  
Sherri Fink  
Bill Gates  
D.A. Henderson

Alexander Langmuir  
Margaret MacMillan  
Ernest May  
Vera Mussah  
Richard Neustadt  
Cameron Nutt  
Michel Van Herp
Presentation Objectives

1. Weigh in on “lessons learned” from the largest Ebola outbreak in history
2. Describe two types of surveillance—disease and healthcare—and their importance in responding to highly pathogenic infectious disease
3. Elaborate on the proposition that CDC’s National Healthcare Safety Network (NHSN), or another single-platform solution, could meet basic surveillance needs in an epidemic
First there is a critical need to reinforce basic public health systems, including primary health care facilities, laboratories, surveillance systems, and critical care facilities, among other components.
For future epidemics, it should be possible to have a system in which information on suspected cases, locations, survivors, and other key elements was entered into a digital database that was instantly accessible to the relevant organizations and agencies. The groups working on the Ebola data – including the WHO, CDC, and others – could recommend specifications and some combination of foundations and technology companies could build such a system within the year.

Community Event-Based Surveillance Manual for Liberia
March 2015
…no one was prepared for the nightmarish spread and magnitude of this epidemic.
“What jumped out at me from the medical report was the hiccups, a typical symptom associated with Ebola,”

Michel Van Herp, MD, MPH, senior viral hemorrhagic fever epidemiologist, MSF

A healthcare worker cleans his hands with chlorinated water before entering an Ebola screening tent, Sierra Leone, Aug. 2014
September 30, 2014

BREAKING NEWS

CDC: FIRST EBOLA CASE DIAGNOSED IN U.S.

Texas Health Presbyterian
DALLAS
U.S. hospitals can safely manage patients with Ebola disease. The key factors are isolation of patients, diligent environmental cleaning and disinfection, and protection of healthcare providers.
Most important, perhaps, Ebola has laid bare the inadequacy of current global mechanisms for detecting outbreaks and quickly mobilizing a response.
Governments should learn from how nations prepare for war. NATO plays war games. Now we need germ games.

The world needs to prepare for the next major health crisis, Bill Gates has told Delegates at the Ted (Technology, Entertainment and Design) conference.
…always wars and plagues take people equally by surprise.

The Plague (1947)
...history and the present are littered with examples of the striking capacity of human beings to overlook, minimize, or explain away evidence that does not fit comfortably with deeply held assumptions and theories.
The Fog of Conflict and Its Effects on Epidemic Detection

Sierra Leone’s and Liberia’s recent histories of civil conflict made it difficult to confirm an outbreak of disease. Public health laboratories were not functioning; it was months before Ebola was recognized as the pathogen.
Using History Successfully

- Limit use of analogies
- Deep understanding of the history of an issue
- Question presumptions
- Bring into play the history of the individuals most concerned and the organizations most affected
Learning From History – Smallpox Eradication, 1959-1979

• Unique achievement in the history of international cooperation
• Initial strategy launched in 1959 relied on mass vaccination and public education
• When disease returned in some areas, an intensified global program, beginning in 1967, added complete surveillance, ring vaccination, and use of heat-stable vaccine
• Administration and operations of national programs were designed for existing health structures and sociocultural environments
Enhanced Smallpox Surveillance

A surveillance team member shows schoolchildren a smallpox recognition card and asks if they know of any cases.
Reflections on the Smallpox Eradication Program

Ultimately, a single element, a single addition to the strategy of the program was responsible [for success] – that change was the incorporation of the principle of surveillance.

...the most powerful, effective, and under-rated tool in communicable disease control is the technique of surveillance.

D.A. Henderson

Langmuir’s Concept of Surveillance

**Practice** – Surveillance is the ongoing collection of pertinent data, consolidation and analysis of these data into actionable information, and dissemination of results to those who have contributed and to all others who need to know.

**Role** - Surveillance is coupled to other core public health functions—prevention and control—but it is a separate discipline and requires its own support.

**History** - Systematic watchfulness over the incidence and distribution of communicable diseases is an extension of vital statistics systems introduced in the 19th century.

Communicable Disease Surveillance

Laboratories

State, County, and Local Health Departments

CDC

Practitioners
Healthcare Surveillance – Related to But Different from Disease Surveillance

As early as the 1950, the federal Centers for Disease Control of the U.S. Public Health Service began, under the leadership of Dr. A. D. Langmuir, to broaden the concept of surveillance [from 19th century vital statistics] by applying it to specific illness rates …

Another and slightly different concept, that of routinely monitoring the results of medical care and using those observations to assist the providers in improving those results, also dates back to the 19th century.

Dual Surveillance Needs Must Be Met to Respond to Endemic and Epidemic Diseases

Disease Surveillance

Healthcare Surveillance

Overlapping Coverage

Data on diseases, injuries, and health risks in the general population

Data on healthcare access, capacities, processes, and outcomes
CDC’s National Healthcare Safety Network (NHSN) – One System for Disease and Healthcare Surveillance

Healthcare Facilities Join NHSN, Complete An Annual Survey of Their Care Capacities, and Submit Process and Outcome Data Manually or Electronically to One or More NHSN Components

- Patient Safety
- Healthcare Personnel Safety
- Blood Safety
- Longterm Care
- Dialysis
- Outpatient Procedure (planned)

CDC collects, analyzes, makes accessible, and summarizes data on healthcare-associated infections, other adverse healthcare events, and adherence to prevention practices
Data Entered into NHSN are Stored and Analyzed Using a CDC Database

Healthcare Facility

CDC

NHSN Database

NHSN Web-based Application

National Healthcare Safety Network
SIR for In-Plan Central Line-Associated BSI Data - By OrgID

As of August 10, 2011 at 4:47 PM
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Manual processes are used to prepare and submit records to NHSN, even when healthcare data are available in electronic form.
The Future of Disease and Healthcare Surveillance: An Electronic Data Supply Chain

- Surveillance system provides protocol and algorithm
  - Reporting protocol for event
  - Executable expressions of event detection and reporting algorithms

- Surveillance system collects, analyses, and posts event data
  - Automated file transfer
  - Data collection, consolidation, analysis, and posting

- EHRs* configured for event detection and reporting
  - Event detection rules applied to patient-specific data
  - Additional rules applied to populate full event report

- Electronic event report

*EHRs = electronic health record system

Healthcare Facility
The Transition from Paper-Based to Electronic Health Record Systems

“The Old is Dying and the New is Not Yet Born”
Google created an 'Ebola-proof' tablet to help fight epidemics

by Devindra Hardawar | @devindra | March 20th 2015 at 5:13 pm
Doctors Hit a Snag In the Rush to Connect

Medical Records Go Digital, but Sharing Them Can Be Costly, or Impossible

By JULIE CHESEWELL

As a practicing ear, nose and throat specialist in Asheville, N.C., Dr. Raghurav B. Geist says that little has frustrated him more than the digital record system he installed a few years ago.

The problem: His system, made by one company, cannot share patient records with the local medical center, which uses a program made by another company.

The two companies are quick to deny responsibility, each blaming the other.

Regardless of who is at fault, doctors and hospital executives across the country say they are distressed that the expensive electronic health record systems they installed in the hopes of reducing costs and improving the coordination of patient care — a major goal of the Affordable Care Act — simply do not share information with competing systems.

The issue is especially critical now as many hospitals and doctors scramble to install the latest versions of their digital record systems to demonstrate to regulators starting Wednesday that they can share some patient data. Those who cannot will face reductions in Medicare reimbursements down the road.

On top of that, leading companies in the industry are preparing to bid on a Defense Department contract valued at an estimated $11 billion. A primary requirement is that the winning vendor must be able to share information, allowing the department to digitally track the medical care of 3.6 million active-duty military personnel around the globe.

The contract is the latest boon to an industry that taxpayers have heavily subsidized in recent years with over $24 billion in incentive payments to help install electronic health records in hospitals and physicians' offices.

While most providers have installed some

Continued on Page 2
Will Mobile Devices and Other Digital Advances Revolutionize Medicine and Transform Disease and Healthcare Surveillance?
Summing Up

• The Ebola outbreak underscores the need for concerted actions to build local healthcare and public health capacity and invigorate international responses to infectious disease threats
• Surveillance data should be seen as vital statistics that are particularly valuable for monitoring disease spread and gauging the impact of control efforts once an outbreak has been identified
• As a practical matter, strengthening or expanding existing disease and healthcare surveillance capacity is more efficient and economical than building new systems in preparation for future epidemics
Thank You!

Please contact me at dpollock@cdc.gov

For More Information about NHSN:
http://www.cdc.gov/nhsn/