

International Society for Disease Surveillance

**Electronic Syndromic Surveillance Using Hospital Inpatient
and Ambulatory Clinical Care Electronic Health Record Data**
Recommendations from the ISDS Meaningful Use Workgroup

November 2012

Disclaimer

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The International Society for Disease Surveillance (ISDS) is a 501(c)3 nonprofit organization founded in 2005 with a mission to improve population health by advancing the science and practice of disease surveillance. ISDS's 430+ membership represents the public health surveillance community, including:

- Local, state, federal, and global public health practitioners and policymakers
- Academic researchers
- Clinical health care providers
- Graduate students
- Government agencies
- Non-profit associations
- For-profit organizations
- Other stakeholders in disease surveillance

ISDS builds surveillance capacity, strengthens surveillance infrastructure, and supports the needs of the global surveillance community by cultivating action-oriented interdisciplinary collaborations, creating networks, and fostering innovations in surveillance.

Ongoing ISDS activities include:

- **ISDS Annual Conference** — The premier event focused on the latest in disease surveillance science and practice with opportunities to interact with the broad-based, multidisciplinary surveillance community.
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- **Communications and Resources** — A website, blog, online forum, and targeted resources designed to advance surveillance literacy and keeping the surveillance community informed and connected.
- **Technical Assistance and Subject Matter Expertise** — Evaluations, consultations, consensus building, and standards development by ISDS Board members, staff, and members to advance surveillance capabilities.

ISDS's work toward a vision of timely, effective, and coordinated disease prevention and response among a skilled public health workforce positions it at the vanguard of the field of disease surveillance. For more information about ISDS, see www.syndromic.org.

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These *Recommendations* are the results of input from many people from across sectors, agencies, and disciplines through comments, surveys, teleconferences, and in-person meetings. The ISDS team wishes to thank everyone who contributed time and effort to this report, at all levels but, especially, the dedicated Workgroup who worked together to bridge perspectives to create recommendations that are feasible and have the greatest utility for advancing the meaningful use of health data.

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Letter from the Chair

Dear Colleagues,

Advances in health information technology in general and the Centers for Medicare and Medicaid Services (CMS) Electronic Medical Record incentive program (Meaningful Use) in particular are providing exciting opportunities to expand electronic public health information exchange across the healthcare and public health continuum. It will, however, take commitment, open dialogue, time, and resources for the public health community and partners to keep pace with the technology developments. This Centers for Disease Control and Prevention (CDC)-funded project lead by the International Society for Disease Surveillance (ISDS), active participation of the multi-disciplinary workgroup members, and feedback by healthcare and public health stakeholders demonstrates the public health community's ability to meet that charge.

The syndromic surveillance objective included in Stage 2 Meaningful Use is an invitation to discover, document, and share information about the broad spectrum of current syndromic surveillance practice beyond the long-standing Emergency Department and Urgent Care settings. It is also fertile ground for exploring new and innovative ways to expand the practice to new clinical care settings and assist with addressing public health challenges that face us today, such as the burden of chronic disease, and those in the future.

The workgroup attempted to balance meeting today's population health goals, actionable syndromic surveillance practices, and resources of public health agencies (PHAs) and partners, while anticipating what the landscape will be in 2016, the inception of Stage 2 Meaningful Use. As a multi-disciplinary workgroup, an array of perspectives, population health goals, obstacles, and opportunities were identified and considered. As a substitute for our lack of prescience, we relied on the evidence base (peer-reviewed and current literature, as well as individual expertise), innovation, enthusiasm, a healthy dose of skepticism, and reality checks from the stakeholder community to formulate our recommendations. I hope they provide a realistic roadmap to the future of syndromic surveillance practice and the success of the Stage 2 Meaningful Use objective, which will in turn contribute to safeguarding and improving the health of our communities and the nation.

As the Chair of the workgroup, I want to take this opportunity to thank CDC for its support, each of the workgroup members, the public health community, and our stakeholders for their invaluable contributions, and ISDS and project staff for their tireless efforts dedicated to this endeavor and its outcome.

Regards,

A handwritten signature in black ink, appearing to read 'Geraldine Johnson', with a stylized flourish at the end.

Geraldine Johnson, MS
Chair, Meaningful Use Workgroup

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Clinical Care Electronic Health Record Data:
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List of Acronyms

CDC:	Centers for Disease Control and Prevention
CEHRT:	Certified EHR Technologies
CSTE:	Council of State and Territorial Epidemiologists
DoD:	Department of Defense
ED:	Emergency Department
EH:	Eligible Hospital
EHR:	Electronic Health Record
EHRT:	Electronic Health Record Technology
EP:	Eligible Professional
ESS:	Electronic Syndromic Surveillance
GI (ID):	Gastrointestinal (Infectious Disease)
HIPAA:	Health Insurance Portability and Accountability Act
HITECH Act:	Health Information Technology for Economic and Clinical Health Act
HTTPS POST	Hypertext Transfer Protocol Secured using the POST method
ILI:	Influenza-like Illness
ISDS:	International Society for Disease Surveillance
MLLP:	Minimal Lower Layer Protocol
MUse	Meaningful Use
NACCHO:	National Association of County and City Health Officials
NYC - PCIP	New York City Primary Care Information Project
ONC:	Office of the National Coordinator for Health Information Technology
PHA:	Public Health Agency
PHINMS:	Public Health Information Network Messaging System
SOAP:	Simple Object Access Protocol-based web services
SFTP:	SSH File Transfer Protocol
UC:	Urgent Care Center
VA:	U.S. Department of Veterans Affairs
VPN:	Virtual Private Network

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Executive Summary



Executive Summary

The implementation of the Meaningful Use provisions of the HITECH Act presents public health agencies (PHAs) with an exciting opportunity to enhance public health monitoring, prevention, and response activities using electronic syndromic surveillance data from inpatient and ambulatory clinical settings. Since PHA readiness for this opportunity varies by an agency's capability and capacity to integrate new surveillance data sources, policy and practice must be aligned to foster worthwhile and feasible innovations for public health practice. National policies should set a floor for clinical data provision that supports early adoption by PHAs without also placing an unjustifiable burden on healthcare providers, and other stakeholders. Data reporting requirements should also support a shared vision of how these new sources can be best applied. Above all, a community dialogue must facilitate the diffusion of new knowledge to promote surveillance practices and capabilities with measurable benefit to personal and population health.

This report presents the ISDS Meaningful Use Workgroup's recommendations to enhance public health surveillance capability with electronic syndromic surveillance data by implementing Meaningful Use. Built upon prior ISDS recommendations for syndromic surveillance using emergency department and urgent care encounter data, which are commonly used by PHAs, the practice and policy guidelines recommended in this report address the use of syndromic surveillance data from inpatient and ambulatory clinical care settings; an opportunity for innovation spurred by Meaningful Use.

The membership of the ISDS Meaningful Use Workgroup represents the range of parties involved in providing and using electronic health record (EHR) data for public health surveillance purposes. A multi-stakeholder committee of clinicians, medical informaticians, technologists, epidemiologists, and public health officials, the Workgroup deliberated and consulted with community stakeholders from October 2011 - August 2012 about inpatient and ambulatory clinical data use in syndromic surveillance. Regarding this opportunity spurred by Meaningful Use, the Workgroup:

1. Assessed current practice and public health community views;
2. Developed guidelines to serve as a basis for enhancing surveillance capabilities; and
3. Provided guidance for national policy regarding Meaningful Use and public health surveillance practice.

The Workgroup's recommendations meet a need for guidance across the spectrum of Meaningful Use. The Workgroup sought to balance current feasibility and resource concerns with community enthusiasm for surveillance innovation with these data. Within this report, readers will find:

1. A snapshot of current PHA use of inpatient and ambulatory clinical data using a syndromic surveillance approach to inform the decision-making by all Meaningful Use stakeholders;
2. An assessment of feasible public health uses of these data for syndromic surveillance that addresses priority issues in public health system planning (Summary Table A);
3. Basic parameters or business rules that inform how these data should be provided by eligible hospitals and professionals (Summary Table B);

4. Core clinical data elements to inform what certified EHR technology must support (Summary Table C); and
5. Clinical data elements that support data uses that extend beyond current capabilities or may in the future inform practice, technology and policy planning (Appendix 1-2).

In addition, the Workgroup provided a number of general recommendations for policy, practice, and research going forward. (Summary Table D).

While the Meaningful Use recommendations for syndromic surveillance data from emergency departments and urgent care centers were developed within a context of common practice, the development of these recommendations for syndromic surveillance using inpatient and ambulatory clinical data addresses a new frontier for surveillance. The ISDS Meaningful Use Workgroup sought to make recommendations that balance feasibility and resource concerns with community enthusiasm for surveillance innovation with these data.

As with all innovations resulting from paradigm shifts, how the opportunities for public health surveillance created by Meaningful Use are used in public health practice will evolve over time. Computing and health information management technologies will advance, lessons will be learned, and the discovery of novel methods will affect PHA readiness for syndromic surveillance using inpatient and ambulatory clinical data. Indeed, the history of syndromic surveillance in the United States is a reflection of this course. Just as emergency department health data were initially sought as a component of bioterrorism preparedness, present day public health priorities will determine the utility of inpatient and ambulatory clinical data. With time and experience, public health will use these newly available data sources for far more than influenza-like illness surveillance and improve public and population health in exciting and unforeseeable ways.

Summary Table A: A comparison of the ISDS Meaningful Use Workgroup's priority surveillance purposes for hospital inpatient and ambulatory data. The listed purposes are meant to provide an array of achievable options without being exhaustive or definitive.

Priority Surveillance Purposes for Electronic Syndromic Surveillance Data	
Hospital Inpatient <i>Hospitalized patients are persons most severely impacted by health threats. Inpatient EHR data, when used in combination with information from emergency, urgent and outpatient care clinical settings, should provide a more complete picture of how the severity of a health event is distributed in a population. Priority purposes for syndromic surveillance with the addition of inpatient data are:</i> 1. Monitor population health by further describing the near real-time impact of disease-outbreaks; 2. Inform public health service delivery by detecting, estimating, and assessing the morbidity and mortality during incidents or events of public health concern; and 3. Inform intervention, policy and health education development and evaluation by characterizing the contributing factors and outcomes of chronic disease related-hospitalizations and health disparities.	Ambulatory Clinical Care <i>Patients in ambulatory or outpatient clinical settings present with conditions that are less severe and specific than those who visit urgent, emergency or inpatient settings. Ambulatory clinical data, when used in combination with information from the other clinical settings, should provide a more complete and earlier picture of how populations are affected by health events. Priority purposes for syndromic surveillance with the addition of ambulatory clinical data are:</i> 1. Monitor population health by describing the volume of outpatient visits for high frequency, non-reportable health events; 2. Inform public health service delivery by detecting, estimating, and assessing morbidity from possible disease outbreaks or other health events of public health concern; and 3. Inform intervention, policy and health education development and evaluation by describing the burden of chronic disease and health disparities.

Summary Table B: A comparison of the ISDS Meaningful Use Workgroup's recommended guidelines for providing electronic syndromic surveillance data from hospital inpatient and ambulatory clinical care settings.

Basic Guidelines for Providing Electronic Syndromic Surveillance Data	
Hospital Inpatient	Ambulatory Clinical Care
<i>Prior to beginning the process of sending ESS hospital inpatient data, data senders and data receivers should:</i> • Register treatment facility information • Determine protocols to securely provide ESS data to the PHA	<i>Prior to beginning the process of sending ESS ambulatory clinical care data, data senders and data receivers should:</i> • Register treatment facility information • Determine protocols to securely provide ESS data to the PHA
<i>ESS hospital inpatient data providers should:</i> • Provide or report ESS data to PHA at least once in every 24 hour period • Provide ESS data for all new hospital inpatient admissions (ESS admission records) • Provide ESS data at least once for all hospital discharges (ESS post-discharge records) • Provide with each ESS admission and post-discharge record de-identified data that can be used to join records for the same visit, and securely used to lookup additional information about a patient visit of public health concern.	<i>ESS ambulatory clinical care data providers should:</i> • Provide or report ESS data to PHA at least once in every 24 hour period with visits • Provide ESS data for all face-to-face clinical encounters • Provide with each ESS record, de-identified data that can be securely used to lookup additional information about a patient visit of public health concern
<i>PHAs, or their designated receivers of ESS hospital inpatient data should:</i> • Determine whether and how new data will overwrite previous data.	<i>PHAs, or their designated receivers of ESS hospital inpatient data should:</i> • Determine whether and how new data will overwrite previous data.

Summary Table C: A summary of the ISDS Meaningful Use Workgroup's core data elements of interest from inpatient and ambulatory clinical settings. Also presented, for comparison, are the core data elements of interest from the CDC PHIN Messaging Guide for Syndromic Surveillance: Emergency Department and Urgent Care Data (Release 1.1)¹. To ensure that nationally certified EHR technologies can support a reasonable range of variation in data requirements based on state and local laws, Meaningful Use certification will be required to demonstrate the ability to message all core required (R - Required, RE - Required, but may be sent empty, and C - conditional), and optional elements (O - Optional).

Data Element Name	Description of Field	Hospital Inpatient	Ambulatory	Emergency Department / Urgent Care
Basic Message Information				
Facility Identifier (Treating)	Unique facility identifier of facility where the patient is treated	R	R	R
Facility Name (Treating)	Name of treating facility where the patient is treated	O	O	O
Facility Street address (Treating)	Street address of treating facility location	O	O	O
Facility City (Treating)	City of treating facility location	O	O	O
Facility ZIP Code (Treating)	ZIP Code of treating facility location	O	O	O
Facility County (Treating)	County of treating facility location	O	O	O
Facility State (Treating)	State of treating facility location	O	O	O
Facility / Visit Type	Type of facility that the patient visited for treatment	N/A	N/A	R
Message Date/Time	Date and time that the report is created / generated from original source	R	R	R
Unique Patient / Visit Identifier	Unique identifier for a patient or patient visit	R	R	R
Medical Record Number	Patient medical record number	N/A	N/A	O
Demographics				
Age	Patient age at time of visit	RE	RE	RE
Age units	Unit corresponding to numeric value of patient age	RE	RE	RE
Gender	Stated gender of patient	RE	RE	RE
Race	Race of patient	RE	RE	RE
Ethnicity	Ethnicity of patient	RE	RE	RE
Patient City / Town	City or town of patient residence	RE	RE	RE

Data Element Name	Description of Field	Hospital Inpatient	Ambulatory	Emergency Department / Urgent Care
Patient ZIP Code	ZIP Code of patient residence	RE	RE	RE
Patient County	County of patient residence	RE	RE	RE
Patient State	State of patient residence	O	O	O
Patient Country	Country of patient residence	O	O	O
Visit Information				
Chief Complaint / Reason for Visit	Patient's self-reported chief complaint or reason for visit	RE	RE	RE
Admit or Encounter Reason	Provider's reason for a patient admission or encounter	RE	RE	N/A
Admit or Encounter Date/Time	Date and time of patient admission or encounter	R	R	R
Date of Onset	Date that patient began having symptoms of condition being reported	N/A	N/A	O
Patient Class	Patient classification within facility	R	R	O
Hospital Unit	Hospital unit where patient is treated	RE	N/A	N/A
Diagnostic and Pre-Diagnostic				
Diagnosis Type	Qualifier for Diagnosis / Injury Code specifying type of diagnosis	RE	N/A	R
Primary Diagnosis	Primary diagnosis of the patient's condition	RE	RE	RE
Additional Diagnosis	Additional diagnoses of the patient's condition(s)	RE	RE	RE
Discharge Disposition	Patient's anticipated location or status following discharge	RE	N/A	RE
Discharge or Disposition Date/Time	Date and time of discharge or disposition	RE	N/A	RE
Triage Notes	Triage notes for the patient visit	N/A	N/A	O
Clinical Impression	Clinical impression of diagnosis	N/A	N/A	O
Vitals				
Height	Height of the patient	O	O	N/A
Weight	Weight of the patient	O	O	N/A

Data Element Name	Description of Field	Hospital Inpatient	Ambulatory	Emergency Department / Urgent Care
Systolic and Diastolic Blood Pressure (SBP/DBP) – Most Recent	Most recent systolic and diastolic blood pressure of the patient	N/A	O	N/A
Initial Temperature	1 st recorded temperature	N/A	N/A	O
Initial Pulse Oximetry	1 st recorded pulse oximetry value	N/A	N/A	O
Risk Factors, Other Factors				
Smoking Status	Smoking status of the patient	O	O	N/A

Summary Table D: Presentation of the ISDS Meaningful Use Workgroup's concluding recommendations for Meaningful Use policy regarding the syndromic surveillance objective, electronic health record certification, and activities to enhance public health surveillance capabilities.

Meaningful Use Workgroup Recommendations
1. The meaningful use of electronic syndromic surveillance data from eligible healthcare professionals and hospitals is attained through the following sequence of proven, best practice steps: 1.1. Step 1: Successful submission of valid test data from a new data source to public health; 1.2. Step 2: Successful on-going submission of data to public health for pre-production processing and testing; and 1.3. Step 3: On-going data submission to public health and full integration of the data into routine surveillance reports and agency activities.
2. Develop or update technical guide(s) for creating HL7 messages that meet the basic data provisioning and core data element guidelines for hospital inpatient and ambulatory clinical care data.
3. For Meaningful Use Stage 3 requirements, the Centers for Medicare and Medicaid (CMS) should: 3.1. Retain electronic syndromic surveillance reporting as a core objective for eligible hospitals. Hospitals must provide data for patients in the Emergency Department setting. Upon request of the public health agency hospitals must also report inpatient data to support local syndromic surveillance practice, pilots, or demonstration projects as authorized by law, regulation, agreement, etc.; and 3.2. Retain electronic syndromic surveillance reporting as an optional objective for eligible professionals to support local syndromic surveillance practice, pilots, or demonstration projects as authorized by law, regulation, agreement, etc.
4. For the next edition of the EHR Certification Criterion for electronic syndromic surveillance, the Office of the National Coordinator for Health Information Technology (ONC) should ensure that: 4.1. Certified EHRs for hospital or urgent care settings demonstrate an ability to electronically record, modify, retrieve, and provide all core data elements for the ED and inpatient settings to a PHA; and 4.2. Certified EHRs for ambulatory or outpatient settings demonstrate an ability to electronically record, modify, retrieve, and submit all core data elements for the ambulatory setting.
5. CMS and ONC should take action to encourage EHR vendors, hospitals and ambulatory practitioners to implement systems that can capture and provide the identified extended data elements for inpatient and ambulatory clinical care settings

Meaningful Use Workgroup Recommendations

6. A multi-disciplinary public health surveillance workgroup (e.g., syndromic surveillance data analysts; infectious disease, chronic disease, environmental health, and occupational health epidemiologists; performance management experts; and informaticians) should be formed and charged with addressing the use of de-identified/limited electronic health data from hospital and ambulatory care EHRs for expanded surveillance purposes to:
 - 6.6. Define the scope of non-infectious disease syndromic surveillance and document business and data requirements;
 - 6.7. Describe the scope and uses of ambulatory care and inpatient data for infectious and non-infectious disease syndromic surveillance
 - 6.8. Describe the use and define the scope and reporting parameters of laboratory order and result data to support infectious and non-infectious disease syndromic surveillance; and
 - 6.9. Define objectives, methods, tools, and evaluation procedures for demonstration projects.
7. Funds should be provided for demonstration projects that define the opportunities and barriers associated with using inpatient and ambulatory EHR data for public health surveillance and response. Specific areas for investigation and/or evaluation include:
 - 7.7. Public health uses beyond influenza-like illness and disaster response; e.g., chronic disease monitoring and injury surveillance; and
 - 7.8. Benchmarking the added value of these data sources as compared to current surveillance systems; e.g., data from syndromic ambulatory clinical care reporting versus data from the Behavioral Risk Factor Surveillance System. Assessments that address validity, timeliness and cost are needed.

Introduction



Introduction

A paradigm shift in United States healthcare policy and practice is resulting in an exciting time of change in public health surveillance. Through implementation of the Meaningful Use provisions of the federal HITECH Act, patient health information is increasingly captured using electronic health record technologies (EHRT), and hospitals and healthcare professionals are encouraged to electronically provide clinical data for public health surveillance purposes. This situation is creating opportunities for public health agencies (PHAs) to enhance their syndromic surveillance systems with health data from new clinical settings. However, with these opportunities comes a responsibility for public health officials to assure healthcare professionals, policy makers, and the public that these data can and will be used to improve and protect population health. A vision of how new health data can best benefit public health is emerging.

In October 2011, the International Society for Disease Surveillance (ISDS), in close partnership with the Centers for Disease Control and Prevention (CDC), convened a Meaningful Use Workgroup to identify how syndromic surveillance data from hospital inpatient and ambulatory clinical care settings can enhance public health practice. A multi-stakeholder committee of clinicians, medical informaticians, technologists, epidemiologists, and public health officials, the Workgroup represented the range of parties involved in providing and using EHR data for public health surveillance purposes. After 11 months of deliberating and consulting with community stakeholders, the Workgroup developed surveillance practice and policy recommendations that meet the present needs for guidance created by Meaningful Use.

This section introduces the ISDS Meaningful Use Workgroup's recommendations with background on the Meaningful Use programs and syndromic surveillance, as well as a review of current practice and community sentiment regarding these relatively new data sources for syndromic surveillance.

Meaningful Use

The Health Information Technology for Economic and Clinical Health Act (HITECH Act), a provision of the American Reinvestment and Recovery Act of 2009, authorizes the Centers for Medicare and Medicaid Services (CMS) and the Office of the National Coordinator of Health Information Technology (ONC) to support EHR adoption and modernization through technology incentive payments and adjustments in Medicare and Medicaid reimbursement rates. To qualify for the incentive payments, and avoid reduced Medicare and Medicaid reimbursements, eligible hospitals (EHs) and professionals (EPs) must become meaningful users of EHR technology and demonstrate an ability to perform a range of functions that support healthcare quality, safety and effectiveness^{2 3}. Also known as 'meaningful use requirements', these functions include providing public health agencies (PHAs) with clinical data to improve population health. With an estimated investment of \$27 billion, these Meaningful Use programs are increasing the rate of EHR adoption among U.S. healthcare providers and influencing how EHR data are captured and shared for public health surveillance.

The incentive programs provide a path to meaningful EHR technology use with three progressive stages that CMS defines (Figure 1)⁴. At Stage 1, first initiated in 2011, the meaningful use requirements focus EHs and EPs on establishing base EHR functionalities including capturing patient health information in a structured format, and providing test public health surveillance information to PHAs. Stage 2 builds upon Stage 1 with requirements that encourage EHs and EPs to use captured health data for continuous clinical quality improvement and more routinely provide PHAs with public health surveillance information⁵. Requirements for Stage 3 have not been determined, but are expected to further promote EHR functionalities that result in measurable improvements in personal and population-based health outcomes. Although EHs and EPs can begin the path to meaningful use in any fiscal year

between 2011 and 2018⁶, incentive payments that offset initial EHR technology costs are significantly higher for early adopters.

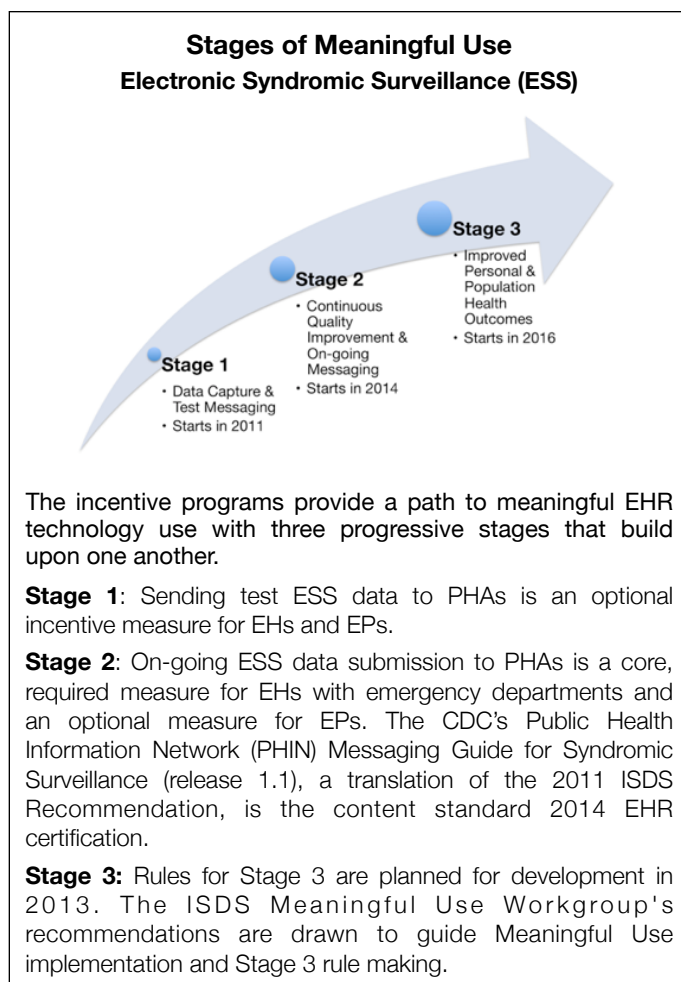
Regardless of stage, the EHR incentives are inextricably tied to the use of ONC certified EHR technologies (CEHRT). Certification is a voluntary process that mainly strives to identify EHR products that can support meaningful use requirements. Secondly, ONC also aims to promulgate health information technology standards, and promote overall health information systems interoperability through certification. EHs and EPs must use CEHRTs to meet all of the meaningful use requirements set by CMS and thereby meet incentive qualifications. In 2010, ONC issued the first edition of EHR certification standards. These rules and standards currently govern EHR certification. The second edition of these criteria is set for enactment in 2014⁷, and future standards are scheduled for development in early 2014.

The Meaningful Use programs promote the provision of syndromic surveillance data with CEHRT to PHAs. Under current CMS rules, EHs and EPs may opt to provide PHAs electronic syndromic surveillance data in Stage 1. At Stage 2, EHs are required to provide PHAs with these data on an on-going basis while this remains an option for EPs. When Stage 2 begins in 2014, CEHRT criteria for syndromic surveillance will significantly change.

Initial certification rules, set by ONC in 2010, were made in the absence of contemporary standards for providing syndromic surveillance data from clinical settings. As such, the only functionality that current EHR technology need demonstrate for Meaningful Use syndromic surveillance certification is an ability to send either HL7 2.3.1 or HL7 2.5.1. Since the CDC and ISDS have developed the PHIN Messaging Guide for Syndromic Surveillance^{8,9}, new ONC certification rules for 2014 will require that EHRs be able to provide specific emergency department and urgent care encounter data elements for certification.

Implementation of Meaningful Use provides opportunities for PHAs to increase surveillance capability with additional syndromic surveillance data sources, data elements, and information from new types of clinical settings are facilitated through Meaningful Use. First, since EHs are required to provide syndromic surveillance data in Stage 2, PHAs can increase demographic and/or geographic system coverage with new sources of emergency department (ED) or urgent care (UC) data. Second, given the new standard for CEHRT in 2014, current syndromic surveillance data providers may acquire, in the near future, an ability to provide additional ED or UC data elements. If this takes place, PHAs may be able to increase the specificity and

Figure 1: A graphic depiction of the stages of Meaningful Use.



sensitivity of surveillance analyses. Finally, given the optional requirement for EPs to provide PHAs with syndromic surveillance data, it is possible that the breadth of population health information a PHA receives for syndromic surveillance may increase with clinical data from entirely new settings. Notably, the structure of current Meaningful Use requirements promotes surveillance system enhancements among clinical data sources with which PHAs have well-established processes and best practices (i.e., EDs and UCs), and yet provides some room for PHAs to pursue innovations with new, inpatient and EP data sources (e.g., primary care practices). Importantly, however, syndromic surveillance CEHRT standards for the hospital inpatient settings and the vast majority of EP settings are absent from ONC rules.

Stakeholder readiness for syndromic surveillance innovation is pivotal to determining future Meaningful Use requirements and CEHRT standards. In addition to ED and UC data, will EHs need to provide PHAs with inpatient data for syndromic surveillance? Should EPs be required to provide PHAs with syndromic surveillance data? And, regardless of CMS requirements, what clinical data should inpatient and ambulatory syndromic surveillance CEHRTs provide? Will it be the same or somehow different than data from ED and UC settings? These questions were at the heart of the ISDS Meaningful Use Workgroup's charge. Answers will determine how the capacities of multiple stakeholders align around the innovation. First, EH and EP capacity to provide any given clinical data element establishes the range of what is possible for public health surveillance. Next, acting as a critical mediating determinant, is the ability of health information technologies to relay the clinical data of interest from the source system to PHAs. Above all else, the capacity and interest that PHAs have to use new clinical data sources for public health prevention and response activities dictates the data of interest. To align these parties, answer those central questions, and find a direction for future Meaningful Use requirements and standards, contemporary public health priorities must be identified and balanced against scientific, technical and resource feasibility issues among all stakeholders.

Syndromic Surveillance

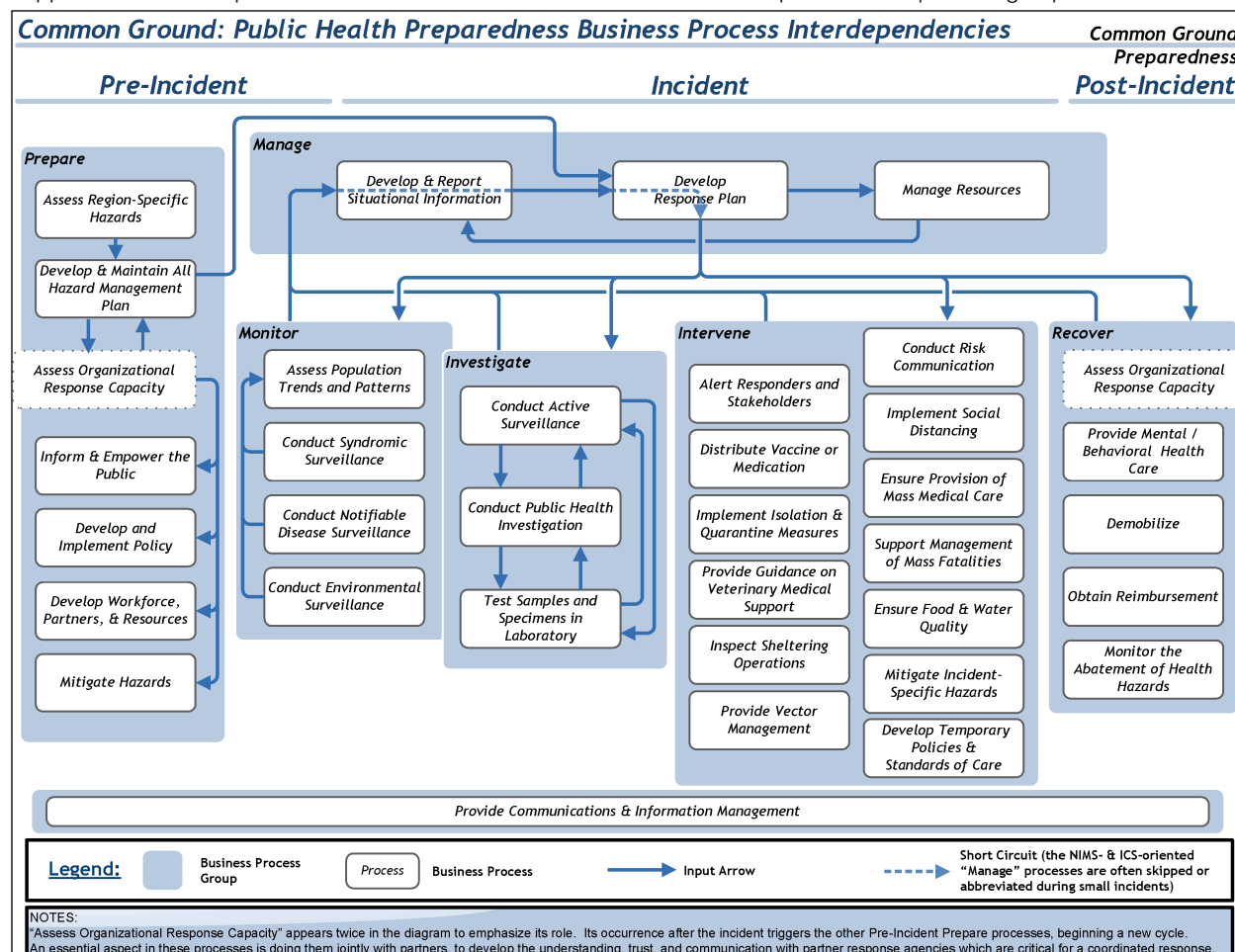
The Institute of Medicine identified assessment, policy development, and assurance as the three core public health functions in "The Future of Public Health"¹⁰. Syndromic surveillance is an increasingly important element of assessment. Similar to other surveillance processes (e.g., reporting of individual cases of reportable conditions by clinicians or laboratories, or behavioral risk factor surveillance), syndromic surveillance systems utilize health and health-related data to produce information to:

"...regularly and systematically collect, assemble, analyze, and make available information on the health of the community, including statistics on health status, community health needs, and epidemiological and other studies of health problems."¹¹

Unlike most other surveillance processes, however, syndromic surveillance uses near "real-time" health-related data and statistical tools. Syndromic surveillance systems enable public health agencies (PHAs) to provide timely assessments of population health that, in conjunction with other information, assist with selecting appropriate public health actions. Syndromic surveillance is particularly useful for situation awareness, response management, and outbreak recognition.

The contribution of syndromic surveillance to the overall operations of PHAs in an emergency preparedness context can be understood within the Common Ground Preparedness Framework¹² (Figure 2). Syndromic surveillance processes, like other surveillance processes, produce information that may trigger a response, alter risk mitigation strategies, or impact the allocation and distribution of resources. This way of thinking about the role of public health surveillance in supporting health agency operations can readily be adapted to a wide variety of public health functions beyond emergency preparedness and response.

Figure 2: The Common Ground Preparedness Framework was developed through a three-year collaboration of eight state and local health departments, brought together to define public health's business processes related to preparedness. The framework has three phases: Pre-Incident, Incident, and Post-Incident. Thirty-three business processes are contained in six business process groups: Prepare, Monitor, Investigate, Intervene, Recover, and Manage. Syndromic surveillance is located within the Monitor process group. A thirty-fourth process involving communications supports all the other processes. Arrows indicate information flow between processes or process groups.



The core business processes and critical tasks of syndromic surveillance are thoroughly detailed in the 2011 ISDS *Recommendations* report¹³. In conjunction with other core public health activities, health agencies use syndromic surveillance processes to:

1. Provide ongoing, timely data and information on public health threats or health conditions of interest;
2. Support early identification or ruling out of public health threats, conditions of public health importance, or suspected incident(s);
3. Assist in characterizing population groups at greatest risk;
4. Assist in assessing the severity and magnitude of possible threat(s) and the effectiveness of control measures;
5. Assist with continual evaluation and development of new and improved surveillance practices;

6. Keep stakeholder organizations, public health leadership, and the public appropriately informed about conditions of public health importance; and
7. Support collaborative efforts with health providers, media, first responders, and government decision makers.

Patient encounter data from healthcare settings are a critical input for syndromic surveillance. These health data are mainly received from emergency department (ED) and urgent care (UC) settings. Syndromic surveillance systems are designed to avoid disrupting patient care and minimize the administrative burden of providing data. Data electronically captured as a routine part of clinical care are used in syndromic surveillance. Specific examples of such electronic health data include patient gender, chief complaint, and discharge diagnosis. Even the transfer of these data elements to PHAs is designed to occur automatically through the provider's information system, decreasing the burden of surveillance information retrieval and delivery to health care service providers. Generally, syndromic surveillance health data are provided to PHAs at least once every 24 hours. However, specific data elements and reporting frequencies vary due to the urgency of a situation and the legal, resource, and population factors that influence public health authority, action and population health.

There are common or core characteristics of syndromic surveillance health data, data reporting and analyses that make a level of standardization possible despite the variations. Together, these characteristics also distinguish syndromic surveillance health data from other types of public health surveillance data. They include:

1. *Timeliness*: Syndromic surveillance systems attempt to maximize timeliness of data delivery to the PHA, and consequently, accept some reductions in the completeness, diagnostic specificity and positive predictive value of complete or individual clinical records. Timeliness is defined relative to the surveillance purposes (e.g. for chronic disease monitoring the faster time frame may be several weeks or months).
2. *Limited Personal Identifiable Information (PII)*: Syndromic surveillance analyses do not require the identification of individuals. Patient identities are concealed within the health data by using a pseudonymized identifier instead of a name. This identifier can then be used by the treating facility to locate a patient's full clinical record if necessary. Some PII data elements that are not allowed in a de-identified record under the HIPAA Privacy Rule (e.g, 5-digit zip code) are necessary for public health purposes.
3. *Data on All Patient Encounters*: Generally, syndromic surveillance health data represent all the patient encounters of a particular type within a treatment facility (e.g. ED registrations, inpatient admissions, or office visits), not a subset of clinical encounters based on specific patient health criteria (e.g., a reportable health condition or environmental exposure).
4. *Population Focus*: Syndromic surveillance analyses monitor and assess overall population health trends rather than the health of individual patients. Syndromic surveillance health data support this population-level focus.

Health data for syndromic surveillance are collected and used by PHAs under the authority granted to them by applicable local and state laws. The HIPAA Privacy Rule exempts PHAs from obtaining patient consent for disclosures of personally identifiable health information when the PHA is authorized by law to collect the information. PHAs are, however, still accountable for protecting and securing any personal identifiable health data they possess from unauthorized use and health care organizations must be able to account for all

disclosures of protected health information. Local or state laws may set requirements that are more stringent than the HIPAA privacy rule.

Inpatient and Ambulatory Clinical Syndromic Surveillance Data

ED and UC syndromic surveillance data are vital to public health practice and, as the surveillance science advances, other clinical data types are increasingly being considered, particularly hospital inpatient and ambulatory data. In support of the Meaningful Use Workgroup's charge, current PHA use of inpatient and ambulatory clinical data in syndromic surveillance and general community sentiment regarding these data were assessed. This assessment informed the Workgroup's process, stakeholder feedback collection, and ultimately the guidelines.

The assessment found that, among United States PHAs and healthcare providers, surveillance using electronic syndromic surveillance data from hospital inpatient and ambulatory clinical care settings is gaining traction as a complement to syndromic surveillance using ED and UC data. The few existing hospital inpatient and ambulatory syndromic surveillance systems tend to vary in system design, population coverage, and data use. To begin inpatient syndromic surveillance, much of the necessary infrastructure and analytic tools are already in place, whereas for ambulatory syndromic surveillance most public health localities will be starting with minimal capacity and analytic experience.

PHAs working to enhance public health surveillance capabilities with these data will need to establish relationships with new data providers, adjust syndromic methods, and determine how to use these data in addressing local public health priorities. Despite these barriers and knowledge gaps, there is substantial interest in the public health community to use hospital inpatient and ambulatory clinical care data in new and innovative ways. However, there is a hesitancy regarding the feasibility of system implementation and actual data use in public health practice, especially in light of current public health resource challenges.

Existing Systems

Relative to the number of PHAs using ED or UC health data in syndromic surveillance, there are few PHAs with syndromic surveillance systems routinely receiving and using hospital inpatient or ambulatory clinical care data. The ISDS Meaningful Use Workgroup identified some inpatient and ambulatory systems operated by health departments, private medical organizations (including HMOs), and researchers who are all conducting syndromic surveillance and related research with inpatient and ambulatory clinical health data (Table 2). While the existing systems differ in important ways, they do share some similarities. Systems vary in how data are captured, integrated, and used to inform public health action. Given this limited and varied picture of current practice, the barriers and knowledge gaps to immediate widespread use of hospital inpatient or ambulatory clinical care data by PHAs are real, as are the opportunities for innovation.

Hospital Inpatient Data Surveillance Systems

The ISDS Meaningful Use Workgroup identified five inpatient syndromic surveillance systems that are operated by state or federal PHAs (Table 1). These systems, initiated between 2003-2011, operate with a variety of set-ups and perform a range of functions. Those PHAs currently using hospital inpatient data in syndromic surveillance find it a worthwhile investment and value the information^{14 15 16 17}.

Table 1: Summary table of systems currently utilizing inpatient and ambulatory EHR data for electronic syndromic surveillance^{18, 19, 20, 21, 22, 23, 24}.

New York City Department of Health and Mental Hygiene Primary Care Information Project (PCIP)	
Data Sources: Ambulatory - Primary Care Practices	Start: 2005
Program Scope: PCIP receives and analyzes aggregate information from primary care practices in New York City	
Program/System Description: Promotes the use of electronic health records in primary care practices, especially in underserved communities; enabled to obtain aggregate count data for quality of care enhancement.	
Sample Use Case(s): Monitor counts of influenza-like illness in New York City to contribute to influenza surveillance.	
Missouri Early Notification of Community-based Epidemics (ESSENCE)	
Data Sources: Hospital Inpatient and ED	Start: 2006
Program Scope: Missouri ESSENCE receives ED visit records from 84 hospitals in the state; 81 of these also send inpatient visit records. This represents about 85 to 90% of all hospital visits each year.	
Program/System Description: Groups chief complaint data into syndrome groups for real-time analysis; also can be used to track known health events through data querying.	
Sample Use Case(s): Tracking and assessing H1N1 pandemic effects.	

Existing inpatient systems capture and integrate data in different ways to address data quality and incentivize data provision. Systems operated by the Department of Veterans Affairs (VA) and the Department of Defense (DoD), for example, capture data within closed healthcare systems. Operationally, this set-up facilitates the dissemination of uniform clinical practices and EHR technology, thereby favoring standardized data entry and coding practices.

In contrast, the statewide systems receive data from a variety of healthcare organizations with varying clinical practices and EHR technology. For state systems, this diversity presents inpatient data that are less standardized than those from VA or DoD hospitals. System processes for data normalization and quality monitoring and control thereby differ between these state and federal inpatient surveillance systems. The existing inpatient surveillance systems also receive data under different legal authorities. For instance, Missouri's ESSENCE system operates under a state mandate, whereas inpatient syndromic data reporting to the Washington State Department of Health is currently voluntary. The VA and DoD systems operate under a federal authority. These jurisdictional differences in authority influence everything from the specific

inpatient data elements provided for surveillance to how an agency uses the surveillance information for their public health work.

Though designed differently, many of the existing systems have leveraged their ED syndromic surveillance resources to integrate the use of hospital inpatient data. Most of the systems listed in Table 1 incrementally added inpatient data by relying on established hospital ED data provider relationships. For instance, three states that collect inpatient data began with the collection of ED data; now, Missouri's ESSENCE system covers 85-90% of the state, Washington's system receives inpatient data from 11 of the 39 counties in the state, and Nebraska's system is currently piloting inpatient syndromic surveillance in one hospital. The technical resources and experience developed to receive, process, and analyze ED data have also been used to acquire the inpatient data. In some cases, the ED and inpatient data are provided by hospitals to these PHAs through the same data transport system. Finally, experience gained with ED syndromic surveillance has helped in understanding the quality of these data and how it can be used.

Table 1 (continued): Summary table of systems currently utilizing inpatient and ambulatory EHR data for electronic syndromic surveillance.

Department of Defense (DoD) ESSENCE	
Data Sources: Ambulatory (military personnel, family members and retirees)	Start: 1999 (2002 for all permanent medical facilities, both US and overseas)
Program Scope: Analyzes all ED and other outpatient visits occurring in DoD military treatment facilities using ICD codes, chief complaint text, laboratory and radiology test orders, and filled pharmacy transactions.	
Program/System Description: Groups elements of medical claims data into syndrome groups for near-real-time analysis (temporal and geospatial), detection, and characterization of disease outbreaks including reportable medical events.	
Sample Use Case(s): Early outbreak detection through characterization and monitoring of outbreaks, e.g., new strains of influenza or norovirus outbreaks.	
Syndromic Surveillance Event Detection of Nebraska	
Data Sources: Hospital Inpatient and ED	Start: 2011
Program Scope: Captures ED (12 hospitals) and inpatient records (1 pilot hospital).	
Program/System Description: Utilizes syndromic surveillance for statewide tracking of cardiovascular disease-related hospitalizations.	
Sample Use Case(s): Track cardiovascular disease and severity using inpatient records.	
Veterans Health Administration ESSENCE	
Data Sources: Hospital Inpatient and Ambulatory	Start: 2005
Program Scope: Began on a limited basis in 2005; expanded in 2007. Includes data on all 152 VA Medical Centers and over 900 outpatient clinics, nursing homes and rehab programs.	
Program/System Description: Utilizes the VA's linked electronic health record system to detect health events both in ambulatory (including telephone triage) and inpatient care settings.	
Sample Use Case(s): Monitor nationwide influenza-like-illness phone calls and outpatient visits as well as influenza hospitalizations. Track administration of regular and high dose influenza vaccinations.	

It is also imperative to explore how these data are used in practice and in research. In practice, the purposes for which hospital inpatient data are utilized vary in scope and content. While all are commonly used for influenza-like-illness (ILI) and gastrointestinal illness (GI) surveillance, some of the systems perform much more than these cornerstone syndromic analyses. For instance, Nebraska's Department of Health and Human Services uses inpatient health data to monitor trends in myocardial infarction in association with risk factors for cardiovascular disease²⁵. Meanwhile, the Missouri Department of Health and Senior Services successfully used inpatient data to track changes in incident-related hospitalizations following the 2011 Joplin, Missouri tornado²⁶.

Syndromic surveillance researchers have developed similarly inventive uses of inpatient clinical data. For instance, inpatient data that are not usually collected for syndromic surveillance have been used to track GI. A sample study done at a healthcare system in California found that clusters of inpatient lab orders for gastrointestinal illness, which are not specific to a disease but are, rather, sensitive to physician suspicion of disease, have been suggestive of GI outbreaks²⁷. Inpatient electronic health records can also aid in characterizing population-level chronic disease trends. A 2011 Rhode Island study derived information on diabetes and heart disease from inpatient EHRs and found high rates of diabetes among hospitalized heart disease patients²⁸. This finding suggests that analyzing hospital data using syndromic surveillance can provide useful population level information.

Given the availability of inpatient data made possible by Meaningful Use, PHAs must determine how to best enhance inpatient syndromic surveillance while acknowledging the barriers and gaps in knowledge that must be overcome. There are fewer barriers to effective syndromic surveillance with

Table 1 (continued): Sample table of systems currently utilizing inpatient and ambulatory EHR data for electronic syndromic surveillance.

Washington State	
Data Sources: Hospital Inpatient and ED	Start: 2003 (ED); 2008 (Inpatient)
Program Scope: Program gathers information from the entire state. 16 of the 39 counties have 1 or more facilities participating in the ED program; 11 of 39 counties also collect inpatient data. 64% of the state's population is covered in total.	
Program/System Description: ESSENCE system collects electronic data and submits to the Washington Department of Health for analysis. 17 of the 45 facilities sending ED data also send inpatient and lab data which can be used to confirm inpatient hospitalizations for influenza.	
Sample Use Case(s): Identify influenza-like illness and de-identified lab confirmed flu (Note: seasonal flu is not a notifiable condition in WA unless resulting in death, so the syndromic method is an additional way to track hospitalized flu cases).	
CDC BioSense	
Data Sources: Hospital Inpatient, Outpatient, and ED	Start: 2003
Program Scope: Aggregates data from local, state and federal public health for use by local and state health departments and CDC.	
Program/System Description: BioSense receives clinical data from multiple state and local health jurisdictions. Data is stored in a secure government cloud environment. Health jurisdictions may store and analyze data there, as well as share with other jurisdictions or CDC at their discretion.	
Sample Use Case(s): Identify health threats at a local, regional and nation-wide level and support responses to those threats.	

hospital inpatient data than ambulatory data since it can be accessed through established relationships with hospitals already sending ED data. However, there are significant gaps in determining how the data will be used and how the system capacity will handle an increased data load. For instance, PHAs need to determine their individual surveillance purposes based on their community's priority health concerns. Additionally, PHAs need to address the increase in data volume that will occur from adding a new data source to existing surveillance efforts. Though the number of inpatient hospitalizations should not eclipse the number of ED visits there will still be an increase in the number of records that must be managed and analyzed. Also, all the PHAs now have access to the new infrastructure for storing inpatient data through BioSense 2.0. Some of the barriers to using inpatient data may be addressed by the addition of BioSense 2.0.

In addition to addressing the systematic barriers, the current practice assessment makes clear that analytic methods need to be honed, data quality must be assessed, and public health action plans need to be developed. PHAs will likely need to evaluate analytic methods to see if inpatient data has epidemiological differences from ED data. Any syndromic surveillance analysis requires a more comprehensive idea of the significance of the collected data. The data quality will also need to be tracked to determine the timeliness, accuracy and validity of the data. Finally, PHAs will need to determine how to react to suspected data anomalies during events of public health significance. For example, if the number of overall

hospitalizations rises, what should the response be? If the number of hospitalizations for a specific diagnosis increases, how should the PHA respond? These questions and others require concrete answers in order for inpatient syndromic surveillance to be effective. The current data provider relationships with hospitals, the existing inpatient systems, and the widespread competencies with ED data use provide a solid foundation for addressing the barriers to using inpatient data for syndromic surveillance. Communities of Practice (CoP), such as the ISDS Public Health Surveillance CoP, provide peer-networking opportunities to share best practices and to jointly develop and evaluate novel syndromic surveillance methods.

Ambulatory Data Surveillance Systems

The ISDS Meaningful Use Workgroup identified four currently established systems that utilize ambulatory clinical care data, ranging from the national BioSense program to the locally run New York City primary care information project (NYC PCIP), all implemented between 1999 (on a very small scale) and 2006 (Table 1). Though relatively few ambulatory systems are in place, additional experience and research findings with ambulatory clinical data suggests that they also have potential utility for public health.

The existing systems, as with inpatient systems, vary in how they address data volume and what types of encounters they capture. Some ambulatory systems, such as the ones operated by the VA, BioSense, and DoD, are highly centralized and utilize standardized EHR information to provide data from ambulatory care settings²⁹. These systems also process and analyze the data in a traditional syndromic surveillance manner. Others, such as the New York City Primary Care Information Project (NYC-PCIP), gather information from multiple primary care physicians' offices and use only aggregated data from these various sources³⁰. The two different approaches to syndromic surveillance data reveal markedly different approaches to addressing potential data volume concerns. Another important characteristic of ambulatory syndromic surveillance systems is how they define an encounter. DoD, BioSense, and NYC-PCIP all receive and analyze only clinical encounter information; in other words, they consider only office visits to be encounters. The VA, however, also uses telephone triage encounter information, adding both to the data volume and the system complexity.

Although differences in ambulatory data surveillance systems abound, partially because of the large number of data providers, there are some similarities in the standardization of the data. For instance, the VA and DoD systems both capture data within a closed healthcare system, allowing for standardized data input protocols as well as a standardized data vocabulary. In addition, even though the NYC-PCIP system collects data from 13 different local community health centers, it utilizes structured data entry (e.g., dropdown menus), which aids with the standardization of the data³¹. In other words, processes are in place that can capture data from different sources while minimizing variability. These processes allow ambulatory data to contribute to a variety of uses for public health.

In both practice and in research, ambulatory data has been used to monitor infectious diseases³², characterize outbreaks³³, maintain situation awareness during disasters³⁴, and monitor chronic disease outcomes and risk factors^{35 36}. In the previously noted NYC-PCIP system, ambulatory care EHR data have successfully identified changes in ILI and GIID trends that correlated closely with detected ED outbreaks³⁷. A perhaps more unique data use occurred during the Salt Lake City, Utah 2002 Olympics when Utah health officials analyzed both ambulatory and ED data streams to monitor the large-scale event for health patterns of public health significance³⁸. Following the Deepwater Horizon Gulf oil spill in 2010, the VA system also utilized ambulatory data to monitor for a variety of health conditions including GIID, respiratory illness, asthma-related illness, and environmental exposures³⁹. Research with ambulatory data has also shown that the data provides a unique ability to identify outbreaks of disease, particularly influenza, early on in the outbreaks and to control the potential spread and resulting increase in hospitalizations⁴⁰. Earlier detection of influenza may also provide PHAs with the ability to contain costs if outbreaks can be halted before they increase in severity.

To effectively use ambulatory clinical data for syndromic surveillance, PHAs must first overcome considerable barriers. Foremost, implementing ambulatory syndromic surveillance is challenging because of the number of healthcare professionals who may provide electronic health information. Recent estimates peg the number of annual U.S. physician office visits at one billion and 56.6% of those visits are to primary care physicians⁴¹. This extraordinary volume of data may be the greatest hurdle facing ambulatory clinical care syndromic surveillance. In addition, syndromic surveillance data-sharing partnerships between ambulatory clinical care providers and PHAs are uncommon. Establishing the business relationships and

syndromic data reporting interfaces in efficient and mutually beneficial ways will require substantial effort and resources. Public health surveillance analysts will need to acquaint themselves with syndromic health data from ambulatory settings. The clinical and EHR processes impacting data quality (e.g. timeliness, accuracy, and validity) need to be understood and indicators developed. The large number of ambulatory data providers further complicates this issue, since data quality will almost certainly vary to some extent among individual providers and healthcare systems. Finally, to effectively use ambulatory data, PHAs will need to identify a signal corresponding to an outbreak or cluster amid substantial “background noise” in the data. Syndromic surveillance systems use an array of aberration detection methods to identify increases in syndromes above predetermined thresholds. However, signal-detection methods have not yet been standardized.. Likewise, response protocols will need to be discerned.

Stakeholder interest

The small number of existing systems does not accurately reflect the interest in acquiring inpatient and ambulatory data for syndromic surveillance. The volume and diversity of stakeholders who commented on the draft versions of the guidelines may be a better gauge of how the public health community regards the use of these clinical data. Over the ten-month development process, more than 125 individuals and professional organizations, including CSTE and NACCHO, across geographic areas and stakeholder groups reviewed the recommendations and contributed to exploring the evidence base. Community members were not only interested in helping to shape the recommendations, they were also interested in using the resultant data. A June 2012 ISDS survey requesting feedback on a draft of the recommendations asked if respondents were likely to use inpatient or ambulatory data; 50% of those who responded indicated they would use the data. Although a convenience sample, this was the most direct measurement of public health community interest in these data for syndromic surveillance.

Stakeholder feedback also provided the Workgroup with a qualitative sense of community opinions towards both this opportunity for syndromic surveillance and early Guideline iterations. Support for the Workgroup’s charge, the importance of inpatient and ambulatory clinical care syndromic surveillance data, and draft Guideline versions was common. Stakeholders expressed the following thoughts in their comments:

“I personally feel that Syndromic Surveillance [inpatient] data will provide us with a complete look at medically attended injury in our state... Another use that we plan to use our syndromic surveillance for is to monitor for stroke and heart disease episodes as well as an evaluation of the medically attended [sic] compared to the census of our state to address health disparities.”

--Public health stakeholder, state health agency

“[ambulatory clinical care data is useful for monitoring] health behaviors - from acute, potentially infectious (GI, resp, etc.) to chronic illnesses (diabetes, heart disease) to mental health. Can assist with detecting changes over time (not necessarily just acute outbreaks, but gradual increases in visits for chronic problems) and situational awareness of the impact of interventions.”

--Public health stakeholder, federal health agency

“In general the guidance offers a sound and carefully considered approach to expanding syndromic surveillance to the inpatient and ambulatory care settings. It provides a standard that will allow EHR vendors to build a usable message while allowing some flexibility to accommodate the differences in state and local laws.”

--Public health stakeholder, state health department

Despite widespread support, knowledge of current practice led a large portion of community stakeholders to question the feasibility of implementing inpatient and ambulatory syndromic surveillance at this point in time. Many stakeholders who commented believe that the barriers, both technical and methodological, are real and pose considerable challenges given the current knowledge and public health resource base. To address this uncertainty, stakeholders expressed a strong belief that demonstration projects, scientific research and public health resources are needed. Ideas for demonstration projects and research include: assessments of hospital inpatient and ambulatory clinical care data quality (e.g., timeliness, validity, and accuracy); demonstrations of alternative information system architecture, processes and methods for data integration and management (most applicable to ambulatory data); and establishing and evaluating new “syndrome” definitions. Stakeholders also noted that maintaining and enhancing public health surveillance capabilities (e.g., workforce) is essential to leveraging these data in public health practice. This is especially true for syndromic surveillance using ambulatory data given the sheer magnitude of providers involved. All of this feedback from stakeholders contributed important information to the Workgroup and substantially shaped the following guidelines.

Guidelines



Guidelines

The following guidelines provide a basis to enhance public health surveillance capability for timely and effective public health prevention and response. The guidelines focus on using electronic syndromic surveillance data from hospital inpatient (inpatient), and ambulatory clinical care (ambulatory) settings. Sources that are newly accessible through Meaningful Use to public health agencies (PHA) for public health surveillance purposes.

With these recommendations, the ISDS Meaningful Use Workgroup intends to meet present stakeholder needs for guidance in:

- Identifying feasible ways that electronic syndromic surveillance data from inpatient and ambulatory clinical settings can be used by PHAs to address public health priorities;
- Methods for providing these data from eligible hospitals and professionals to PHAs;
- Determining the minimum clinical data from these sources that are necessary for syndromic surveillance at this point in time; and
- Identifying data that are needed to extend the utility of these clinical data sources in public health practice. (See [Appendix 1](#) for inpatient data elements of interest that are an extension of the core or for future consideration and [Appendix 2](#) for ambulatory data elements that are an extension of the core or for future consideration.)

These guidelines detail a floor, or base-level requirement suitable to current practice. With time, new capabilities and business practices will emerge and the conditions upon which these guidelines have been drawn will change. Public health agencies (PHAs) that access these data are advised to use these guidelines by adapting them to reflect jurisdictional interests, needs and abilities. It is important to note, however, that deviations from these guidelines at a local level by each PHA, especially within the context of Meaningful Use, will significantly increase the work associated with implementing data-reporting interfaces.

Scope

There are important topics that, although related, are beyond the scope of these guidelines. These topics include:

- Clinical quality improvement in which public health surveillance systems are used to improve patient-level, healthcare quality and safety (e.g., hospital acquired infectious disease)—these guidelines intend to support this function but not interfere with it.
- Reportable conditions surveillance that require individually named case reports to PHAs by hospitals, laboratories and clinicians as required by state reportable disease laws.

Assumptions

In creating these Guidelines, the Workgroup made the following assumptions:

1. Implementing these Guidelines may require individualized changes to comply with existing or future local and state laws;

2. Local and state laws may further impact what patient health data can be shared between covered entities (e.g., healthcare organizations) and PHAs;
3. Participating PHAs have or will have to develop the infrastructure, capability and capacity to receive, manage, analyze, and meaningfully use the specified health data;
4. Eligible professionals will collect data during their routine workflow and have the infrastructure, capability, and capacity to send the health data specified by these Guidelines; and
5. EHR installations vary from a single integrated system to multiple individual departmental, functional, or modularized systems; this may potentially affect data consistency and the complexity of system implementation and use.

Guidelines for Using Hospital Inpatient EHR Data

During an event of public health concern, using hospital inpatient data with syndromic surveillance methods has the potential to provide public health agencies (PHAs) with a more detailed understanding of the characteristics and severity of an illness, health condition or event. These clinical data may also provide additional information on potentially hazardous environmental conditions. Routinely monitoring hospitalization trends will be necessary for surveillance analysts to identify and interpret admission and discharge variations related to infectious disease agents, environmental hazards, health behaviors, population vulnerabilities, chronic diseases and disasters. If used by health officials and public health event response partners (e.g., healthcare providers and policy makers), such situational information may prove valuable in strategic initiatives that seek to improve or protect population health.

To use these guidelines, PHAs are advised to leverage existing information management infrastructure and syndromic surveillance processes to on-board and use these data. Employing best practices during on-boarding and evaluating data quality prior to production are critical to having the capability to interpret these data with confidence.

Inpatient Priority Surveillance Purposes

The ISDS Meaningful Use Workgroup suggests that, based on practical experience, research findings, economic considerations, national health priorities and community stakeholder input, using EHR technology to report electronic syndromic surveillance (ESS) data from **hospital inpatient settings** may best support three (3) priority public health surveillance purposes:

1. **Monitor population health** by further describing the near real-time impact of *disease outbreaks*;
2. **Inform public health service delivery** by detecting, estimating, and assessing the morbidity and mortality during *incidents or events of public health concern*; and
3. **Inform intervention, policy and health education development and evaluation** by characterizing the contributing factors and outcomes of *chronic disease related-hospitalizations and health disparities*.

Note that these purposes will be most fully achieved when all eligible hospitals in a jurisdiction are participating and data represent larger population coverage.

These purposes are deemed to be priorities for improving public and population health, but are not meant to be all-inclusive or prescriptive. Therefore, national EHR technology certification standards should **begin** with a data and reporting model that describes what is minimally required for these purposes.

Contribution to population health monitoring

An integral function of electronic syndromic surveillance systems is supporting population health monitoring, a fundamental and routine epidemiological task. With near real-time clinical data from inpatient admissions and discharges, PHAs will gain more timely insight into the severity of events of public health significance. In rare instances, serious population health events may be more readily detectable from hospital admission data than from emergency department visit data since greater diagnostic detail is available in inpatient records.

Specific examples of how inpatient data can be used to contribute to population health monitoring include (some of these may be noted in the Introduction section as well):

- Monitoring influenza hospitalization rates in conjunction with ED and ambulatory care visits to gauge the severity of an influenza season (e.g., Department of Veterans Affairs hospitals)⁴²;
- Monitoring hospital admissions for syndrome categories that may indicate bioterrorism, such as fever and rash (e.g., Connecticut Department of Public Health)⁴³.

Inpatient data may also be effectively used in many of the same ways as Emergency Department data are to help monitor population health. These uses include:

- Monitoring for severe, acute exacerbations of chronic disease, such as asthma (e.g., Washington, D.C. Emergency Departments)⁴⁴; and
- Monitoring injury trends, such as bicycle accident related injuries (e.g., Boston Public Health Commission)⁴⁵.

Ways that stakeholders believe inpatient clinical care data *might be used* to develop health education and policy include:

- Identifying and/or characterizing severe disease or injury and outcome related to a special event, such as a sporting competition or national convention.

Information for public health services

Syndromic surveillance systems can serve as an important link to public health services. Once a public health condition of interest has been recognized, syndromic surveillance information can help direct and manage public health investigations, interventions, and resources. The addition of clinical data from inpatient admissions and discharges has the potential to enhance event or emergency-related public health response activities.

Specific examples of how inpatient data are being used to help inform public health services include:

- Tracking the burden of storm-related conditions on hospitals in and around Joplin, Missouri following the 2011 tornado (e.g., Missouri Department of Health and Senior Services ESSENCE)⁴⁶ to maintain situation awareness following a disaster; and
- Detecting exposure-related events, using reason for admission, to inform potential emergency response activities (e.g., BioSense)⁴⁷.

Inpatient data may also be effectively utilized in many of the same ways as Emergency Department data are to help inform public health services. These uses include:

- Documenting the occurrence and then the disappearance of hospital admissions resulting from the absence of medical services, such as dialysis. This may occur in communities that see a disruption in basic medical services immediately following a natural disaster (e.g., Hurricane Wilma, Broward County Health Department)⁴⁸;
- Tracking severity of asthma and upper respiratory infection associated with high pollen and environmental allergen counts to provide public health with information on severe allergy seasons⁴⁹, (e.g., Washington, D.C. ED data).

Ways that stakeholders believe inpatient clinical care data *might be used* to develop health education and policy include:

- Event monitoring or early event detection of infectious disease outbreaks.

Information for selecting, developing, and evaluating interventions and developing health education and policy

Periodically, health data and subsequent analyses are utilized for less acute, time-critical purposes, such as when syndromic surveillance systems are used to evaluate interventions or support health education and public health policy activities. Currently, robust data collected by state-level hospital discharge systems are widely used for these purposes. Those data, however, can be up to 2 - 3 years old when made available to PHAs, and this limits the speed by which health officials and policy makers can make informed and timely decisions about prevention interventions, community education, and public health policy initiatives. Providing hospitalization data more routinely will better support PHAs in their efforts to address priority public health issues.

Specific examples of how inpatient data are being used to contribute to information for evaluating interventions and developing health education and policy include:

- Monitoring instances of myocardial infarction and their association with risk factors for cardiovascular disease (e.g., Nebraska Department of Health and Human Services)⁵⁰ to inform public health policies aimed at reducing the burden of chronic diseases;
- Monitoring rates of heat-related hospital visits (both ED and inpatient) to develop, evaluate, and improve community preparedness for heat waves (e.g., California hospital data)⁵¹; and

Ways that stakeholders believe inpatient clinical care data *might be used* to develop health education and policy include:

- Tracking short-term impacts (over periods of 6 months to 3 years) of prevention interventions within localized geographies; e.g., city or town laws banning smoking in bars.

Basic Guidelines for Providing ESS Hospital Inpatient Data

The following guidelines, or parameters, for data providers (i.e., senders) and PHAs (i.e., receivers) are basic for the public health surveillance purposes prioritized above. They are also designed to minimize the amount of data a PHA will need to process, analyze, and store for these surveillance priorities. Community priorities may demand more than these basic parameters, which may require additional work and resources by data providers and PHAs.

If a PHA wishes to use these data for purposes other than those prioritized by the ISDS Meaningful Use Workgroup, then these parameters should be adjusted accordingly. For example, more frequent data updates may be needed may be required. Regardless, any implementation requires specific rules that must be determined and agreed upon by all parties involved in providing and using these data (e.g., hospital, EHR technology vendor, information brokers, health information exchanges, data receiver, and public health authority). These health data transactions must comply with applicable jurisdictional laws, regulations, and policies.

Basic Data Reporting Parameters

Prior to beginning the process of sending ESS hospital inpatient data, data providers and data receivers should:

- **Register Treatment Facility Information**

Before providing ESS data, information about the treating facility should be recorded by the PHAs receiving the data. Registering these metadata under a unique facility identification number will minimize the

size of routinely sent ESS data, in addition to helping PHAs identify, validate, and assess data transmissions. A process commonly used to establish and maintain syndromic surveillance data sharing partnerships, including facility registration, is detailed in the 2011 ISDS Recommendation Report⁵².

The metadata captured during registration should minimally include the following:

- Treatment Facility Name
- Treatment Facility Location / Address
- Unique Treatment Facility Identifier
- Umbrella Organization, if applicable
- Treatment Facility Type or Specialty

As state and regional health information exchange organizations develop, additional registration information may be required to ensure that PHAs can contact clinical data sources and document data provenance.

- **Determine protocols to securely provide ESS data to the PHA**

The data sender and PHA must determine how the data will be securely provided by electronic means. Determining the preferred transport method may not be difficult since hospital connections to PHAs have, in many cases, been in place for years. In such relationships, virtual private network (VPN) connections are typically used to support a number of protocols including SFTP, MLLP, HTTPS POST. However, since some common technologies used for sending public health data are aging (e.g., PHINMS), and there are improved means available (e.g., SOAP-based web services or Direct), it is essential that data providers and PHAs work together to implement the best solution when implementing the provision of inpatient data.

ESS hospital inpatient data providers should:

- **Provide or report ESS data to PHA at least once in a 24 hour period**

Electronic syndromic surveillance hospital inpatient data should be routinely provided, reported, transmitted or sent to PHAs. The frequency of this routine should, at a minimum, be at least once every 24 hour period (Figure 3). Each time data are reported, all ESS data elements should be sent. As mentioned above, PHAs may require a more frequent reporting routine (e.g., twice or four times every 24 hours).

- **Provide ESS data for all new hospital admissions (ESS admission records)**

Senders should provide records for every patient admitted to the hospital since the last time ESS data were reported, transmitted or sent to the PHA (Figure 3). In others words, ESS data on all new admissions during a reporting period should be sent. Applicable public health jurisdictional laws, policies and practices may further constrain these ESS data by other clinical or hospital administrative events (e.g., changes in diagnoses or hospital unit).

- **Provide ESS data at least once for all hospital discharges (ESS post-discharge records)**

Senders should also provide ESS data for every admitted patient at least one time following their discharge. At a minimum, this post-discharge update to visit records should be provided for all patients newly discharged since the last the last time ESS data were sent to the PHA. ESS data for discharges and admissions may be sent simultaneously (Figure 3).

Under applicable jurisdictional laws, policies and practices, PHAs may request ESS data more than once following discharge. PHAs may also request ESS data days or weeks following discharge in order to have more complete data (e.g., diagnoses administratively assigned hours, days or weeks after discharge).

- **Provide with each ESS admission and post-discharge record, de-identified data that can be used to join records for the same visit, and securely used to lookup additional information about a patient visit of public health concern**

Senders should provide data (e.g., a record identifier) with all ESS records that enable two critical, syndromic surveillance tasks: 1) Combining admission and post-discharge ESS data for the same hospital visit; and 2) working with hospitals to find additional visit information for syndromic surveillance signal confirmation or investigation. These data for record management and public health investigation purposes should not be personal identifiable data (e.g., patient name). Visit ID, a core data element of interest discussed below, is currently used with ESS ED data to fulfill this requirement.

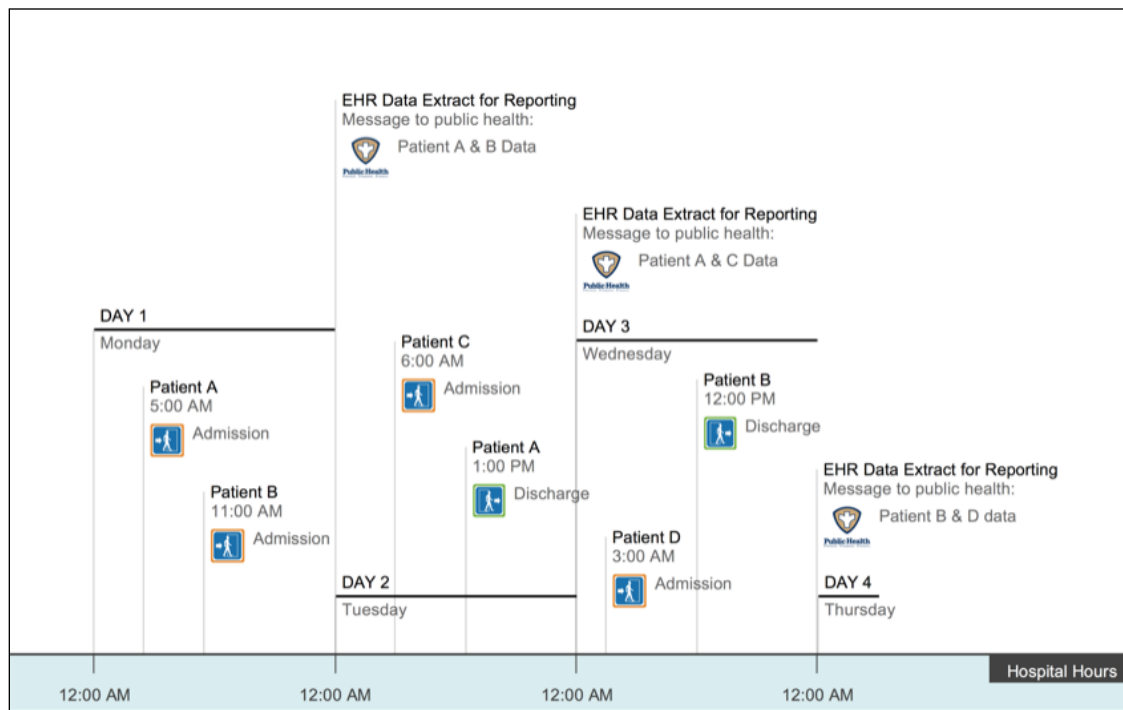
Under applicable jurisdictional laws, policies and practices, PHAs may require or request personally identifiable information for syndromic surveillance.

PHAs or their designated receivers of ESS hospital inpatient data should:

- **Determine whether or not new data will overwrite previous data.** *If data in new records are valued differently than those in the old records, a determination must be made as to whether old values will be overwritten, retained or archived.*
- If ESS data are desired more frequently than once every 24 hours, the desired frequency must be specified to data providers.
- If a subset of inpatient records is desired, determine the clinical or hospital administrative actions that define the subset.
- If ESS data are desired between admission and discharge events, determine the clinical or hospital administrative events that will trigger data provision.
- If more complete discharge ESS data are desired, determine the timeframe following discharge that the sender should provide the data, and determine when the records will be "closed".
- If the ability to join all ESS data records for a patient is desired, provide requirements for a pseudonymous record identifier that uniquely distinguish a patient from all other patients treated by a single facility, institution or healthcare system. A master patient index number is a data concept that may fulfill this requirement.
- If the ability to longitudinally link visit records by patient is desired, as may be necessary for chronic disease surveillance purposes, require a pseudonymous patient identifier for each visit record that uniquely distinguish a patient from all other patients treated by a single facility, institution or within a healthcare

system. A master patient index (MPI) identifier will only allow linkage of visits for an individual to a single institution. A regional MPI or some other mechanism is necessary to allow population surveillance of chronic diseases.

Figure 3: Graphic depiction of the basic parameters for electronic syndromic surveillance (ESS) data provision from a hospital inpatient setting to a public health agency (PHA). Data elements of interest are provided to a PHA at least once every 24 hours. Each time records are provided, all new admission records should be sent. Also, ESS data for every admitted patient for every admitted patient should be provided at least one time following their discharge. At a minimum, this post-discharge update should occur for all patients newly discharged since the last the last time ESS data were sent to the PHA. ESS data for discharges and admissions may be sent simultaneously. These parameters are subject to change based on existing or future local and state laws.



Core Data Elements of Interest

The following hospital inpatient data elements are core to fulfilling the public health surveillance purposes prioritized above (Summary Table A). These data do not support the full spectrum of practice. Data elements and their specifications are subject to applicable local and state laws and practices.

In addition to supporting the priority surveillance purposes, the core data elements selected by the workgroup met the following criteria:

- Data are collected as part of routine clinical work.
- Collection minimizes the impact of public health surveillance on clinic care.
- Extraction of the element from electronic medical record databases is technically feasible.
- The extraction functionality is economical and does not negatively impact healthcare provider workflow for providers and does not make reporting cost prohibitive.
- Collection is sustainable for healthcare providers. The goal is to avoid making extraction too difficult, which may inhibit adoption.

The ISDS Workgroup's rationale and thoughts regarding each element are presented along with detailed guidelines below. In addition to a name, description, cardinality and possible code sets or vocabularies, data usages for PHAs are provided. These usages are defined as follows:

Data Usages

R - Required

The data element will always be provided from hospital systems, and public health data receiving systems must be configured to receive and process the element.

RE - Required, but may be sent empty

The data element will always be provided from hospital systems if and only if it is collected, and public health data receiving systems must be configured to receive and process the element.

O - Optional

The PHA needs to let data providers or senders know whether or not the element must be sent, and receiving systems configured accordingly.

Hospital inpatient data elements for syndromic surveillance that are an extension of the core or for future consideration are presented and discussed in Appendix 1.

Hospital Inpatient: Core Data Set - Detailed Data Definitions

Basic Message Information

1.1 Facility Identifier (Treating)

Unique facility identifier of facility where the patient is treated (original provider of the data)

Core R Cardinality: [1..1]

Rationale: Provides identification of where the patient is treated

Value Set: National Provider Identifier

- Notes:
- Use facility identifier for state or local reporting only. This is due to agreements with many health data providers that explicitly state that states or localities will not expose them to a third party like the federal government when reporting above state level.
 - This number should be specific for each facility location (not a number representing an umbrella business).
 - It is recommended that National Provider Identifier (NPI) be used for the Facility Identifier.

1.2 Facility Name (Treating)

Name of the treating facility where the patient is treated

Core O Cardinality: [0..1]

Rationale: Provides identification of where the patient is treated

Value Set: Free text

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

1.3 Facility Street Address (Treating)

Street address of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: Free text

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

1.4 Facility City (Treating)

City of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: Free text

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

1.5 Facility ZIP Code (Treating)

ZIP Code of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial -temporal patterns for analysis based on where the patient is treated

Value Set: USPS

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

1.6 Facility County (Treating)

County of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: FIPS 6-4

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

1.7 Facility State (Treating)

State of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: FIPS 5-2.

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

1.8 Message Date/Time

Date and time that the report is created / generated from original source (from treating facility)

Core R Cardinality: [1..1]

Rationale: Key element for managing the data

Value Set: None

Notes: If data flows through an intermediary or third party, the intermediary must keep the original date/time of report creation / generation.

1.9 Unique Patient / Visit Identifier

Unique identifier for the patient or visit

Core R Cardinality: [1..*]

Rationale: Provides the ability for PHA to conduct reach-back if necessary

Value Set: HL7 Table 0203. <http://phinvals.cdc.gov/vads/ViewValueSet.action?id=0B1911BC-E324-E011-B71B-00188B39829B>

Notes:

- Data providers and PHAs should determine which unique identifier(s) will be sent in accordance with applicable local and state laws for the purpose of conducting reach-back if necessary. Examples of identifiers are unique visit identifiers or unique patient identifiers, such as medical record numbers, or account numbers. Identifiers may be pseudonymized by replacing identifying fields within a data record with artificial identifiers to protect patient privacy.
- Pseudonymization of the patient identifier may be used to enable data senders to protect patient privacy and still allow re-identification of records upon request of the PHAs if reach-back is necessary. Pseudonymization is the process by which identifying fields within a data record are replaced by artificial identifiers. The pseudonymized identifier should be linked back to the original patient record in a way that is accessible to authorized users
- If the sender and receiver agree to support record linkage (of patient records across multiple encounters), a Unique Patient Identifier should be used that will allow the matching and linking of a patient's records across multiple encounters.

Demographics

2.1 Age

Numeric value of patient age at time of visit

Core RE Cardinality: [0..1]

Rationale: Provides information about the affected population. Age is RE since there may be instances (i.e. unconsciousness) where patients cannot provide the information needed for this field.

Value Set: None

Notes: In order for age to be de-identified, age must be rounded to an integer.

- For patients age greater than or equal to ($\geq$) 2 years old, report in whole years.
 - Truncate age to integer. For example, 16.75 years = 16 years old
- For patients less than ($<$) 2 years old:
 - Report the age in integer months. Do not report days or weeks.
 - Truncate month to integer. For example, 5 months and 20 days = 5 months

2.2 Age units

Unit corresponding to numeric value of patient age

Core RE Cardinality: [0..1]

Rationale: Identifies the unit for the age value

Value Set: UCUM Age Units

Notes: Unit value should be "Year" for patient greater than or equal to ($\geq$) 2 years old. Unit value should be "Months" for patients less than ($<$) 2 years old.

2.3 Gender

Stated gender of patient

Core RE Cardinality: [0..1]

Rationale: Helps to characterize the outbreak / condition of interest by person/place/time that may be affected by this social determinant

Value Set: CDC Gender (Syndromic Surveillance) Value Set:

<http://phinvads.cdc.gov/vads/ViewValueSet.action?id=6358110D-9517-E011-87A0-00188B39829B>.

Values include:

- F = Female
- M = Male
- O = Other
- U = Unknown

Notes: None

2.4 Race

Race of patient

Core RE Cardinality: [0..*]

Rationale: Helps to characterize the outbreak / condition of interest by person/place/time that may be affected by this social determinant

Value Set: CDC Race Category Value Set: <http://phinivads.cdc.gov/vads/ViewValueSet.action?id=67D34BBC-617F-DD11-B38D-00188B398520>.

Values include:

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Other Race

Notes: None

2.5 Ethnicity

Ethnicity of patient

Core RE Cardinality: [0..*]

Rationale: Helps to characterize the outbreak / condition of interest by person/place/time that may be affected by this social determinant

Value Set: CDC Ethnicity Group Value Set: <http://phinivads.cdc.gov/vads/ViewValueSet.action?id=35D34BBC-617F-DD11-B38D-00188B398520>.

Values include:

- Hispanic or Latino
- Not Hispanic or Latino

Notes: None

2.6 Patient City / Town

City or town of patient residence

Core RE Cardinality: [0..1]

Rationale: Helps characterize spatio-temporal patterns for analysis based on patient's residence. Potential proxy to identify socio-economic disparities. Can identify out of state patients for treatments/conditions. This data element is RE to allow for differences in geographical characterization between jurisdictions (i.e., some states operate public health activities on a county level, others on a city/town level, etc.) By making City/Town, ZIP and County all Core (RE) PHAs will have access to the necessary geographic information.

Value Set: Free text

Notes: None

2.7 Patient ZIP Code

ZIP Code of patient residence

Core RE Cardinality: [0..1]

Rationale: Helps characterize spatio-temporal patterns for analysis based on patient's residence. Potential proxy to identify socio-economic disparities. Can identify out of state patients for treatments/conditions. This data element is RE to allow for differences in geographical characterization between jurisdictions (i.e., some states operate public health activities on a county level, others on a city/town level, etc.) By making City/Town, ZIP and County all Core (RE) PHAs will have access to the necessary geographic information.

Value Set: USPS

Notes: Provide 5 digits for domestic ZIP Code. Foreign postal codes should be supported.

2.8 Patient County

County of patient residence

Core RE Cardinality: [0..1]

Rationale: Supports the Federal use case. County helps to further target spatio-temporal patterns since ZIP Code can cross multiple counties. This data element is Core RE to align with the ISDS ED/UC Recommendations and to allow for differences in geographical characterization between jurisdictions (i.e., some states operate public health activities on a county level, others on a city/town level, etc.) By making City/Town, ZIP and County all Core (RE) PHAs will have access to the necessary geographic information.

Value Set: FIPS 6-4

Notes: None

2.9 Patient State

State of patient residence

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on patient's residence. It is also a readily available data element that is useful if other patient location data elements are not available.

Value Set: FIPS 5-2. Use numeric code

Notes: None

2.10 Patient Country

Country of patient residence

Core O Cardinality: [0..1]

Rationale: There are some foreign countries that use 5 digit zip codes, so country is needed to help identify if patient is international.

Value Set: ISO 3166-1. Country Value Set. Use 3 character codes

Notes: None

Visit Information

3.2 Chief Complaint / Reason for Visit

Short description of the patient's self-reported chief complaint or reason for visit

Core RE Cardinality: [0..*]

Rationale: Helps identify conditions of public health concern.

Value Set: Free text (Preferred)
OR ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)
OR SNOMED Disorder / Disease domain

- Notes:
- This field is the patient's **self-reported** chief complaint or reason for visit. It is distinct from the Admit Reason field which is the **provider's reason** for admitting the patient
 - Senders should send the most complete description of the patient's chief complaint. In some cases, this may entail sending multiple chief complaint values.
 - If both the free text chief complaint text and drop down selection chief complaint text are available, send both.
 - Some systems may automatically overwrite chief complaint with final diagnosis when the final diagnosis code is assigned. The chief complaint text should NOT be replaced with other information either manually or by the data provider's system. Keep the chief complaint the same as how it was captured at time of admission.

3.3 Admit Reason

Short description of the provider's reason for admitting the patient

Core RE Cardinality: [0..*]

Rationale: Helps identify conditions of public health concern. This field is a counterpart to the chief complaint fields for ED.

Value Set: ICD-9 or -10 Clinical Modification diagnosis code
Or SNOMED Disorder/ Disease domain
Or Free Text

- Notes:
- This field is the **provider's reason** for admitting the patient. It is distinct from the Chief Complaint / Reason for Visit field which is the patient's **self-reported** chief complaint or reason for visit.
 - Senders should send the richest and most complete description of the patient's reason for admission or encounter. If both free text and drop down selection text are available, send both. If only drop down list fields are available, then concatenate all drop down list values selected and submit.

3.4 Admit Date/Time

Date and time of admit

Core R Cardinality: [1..1]

Rationale: Helps identify temporal patterns

Value Set: None

Notes: None

3.5 Patient Class

Patient classifications within facility

Core R Cardinality: [1..1]

Rationale: Used to identify which data stream (setting) the record is coming from.

Value Set: Constrained HL7 Table 004: <https://phinvads.cdc.gov/vads/ViewValueSet.action?id=2E275396-9717-E011-87A0-00188B39829B>. Limit values only to E: Emergency; I: Inpatient; O: Outpatient

Notes: None

3.6 Hospital Unit

Hospital unit where patient is at the time the message is sent (admission and discharge)

Core RE Cardinality: [0..*]

Rationale: Provides some indication of severity.

Value Set: TBD (Possibly NUCC). Examples of values used in this field may include:

- General Surgery,
- Medical ICU,
- Adult ICU,
- Medical Surgical,
- Burn,
- Pediatric ICU,
- Pediatric,
- Negative Pressure Isolation
- Isolation

Notes: If multiple values are available, send all values.

Diagnostic and Pre-Diagnostic

4.1 Diagnosis Type

Qualifier for Diagnosis / Injury Code specifying type of diagnosis

Core RE Cardinality: [0..*]

Rationale: Helps identify the type/status of diagnosis since it may change over time.

Value Set: Value Set: HL7 v2.5.1 Diagnosis Type (Table 0052), Values include: A = Admitting, F = Final, W = Working.

Notes: None

4.2 Primary Diagnosis

Primary diagnosis of the patient's condition

Core RE Cardinality: [0..1]

Rationale: Identifies which diagnosis is the main diagnosis to help identify conditions of public health concern

Value Set: ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)
Or SNOMED Disorder/ Disease domain
Or Free Text

Notes:

- Diagnosis from the provider (EHR) is preferred over the diagnosis provided through billing
- Include V-codes and E-codes. When the primary diagnosis code is an injury, also provide one or more supplemental external-cause-of-injury codes or E-codes. E-codes provide useful information on the mechanism and intent of injury, place of occurrence, and activity at the time of injury.
- When sending data, Primary Diagnosis and Additional Diagnosis may be reported using the same data field. The data elements are separated in the Guidelines in order to distinguish the PHA use/significance between the two data elements.

4.3 Additional Diagnosis

Additional diagnoses of the patient's condition(s)

Core RE Cardinality: [0..*]

Rationale: Identifies other diagnoses to help identify conditions of public health concern

Value Set: ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)
Or SNOMED Disorder/ Disease domain
Or Free Text

Notes:

- Diagnosis from the provider (EHR) is preferred over the diagnosis provided through billing.
- Include V-codes and E-codes. When the primary diagnosis code is an injury, also provide one or more supplemental external-cause-of-injury codes or E-codes. E-codes provide useful information on the mechanism and intent of injury, place of occurrence, and activity at the time of injury.
- When sending data, Primary Diagnosis and Additional Diagnosis may be reported using the same data field. The data elements are separated in the Guidelines in order to distinguish the PHA use/significance between the two data elements

4.4 Discharge Disposition

Patient's anticipated location or status following discharge

Core RE Cardinality: [0..1]

Rationale: Helps identify severity of patient's condition and any indication of death

Value Set: National Uniform Billing Committee (NUBC) –Patient Status (UB04 -Field 17 Codes).
<http://phinvads.cdc.gov/vads/ViewValueSet.action?id=29D34BBC-617F-DD11-B38D-00188B398520#>

Notes: Include both the code and text description of the code. This field should indicate patient death, if applicable.

4.5 Discharge Date/Time

Date and time of discharge

Core RE Cardinality: [0..1]

Rationale: Identifies the date/time associated with the patient discharge to help manage the data

Value Set: None

Notes: None

Vitals

5.1 Height

Height of the patient

Core O Cardinality: [0..1]

Rationale: Allows calculation of Body Mass Index (BMI), which may be an indicator of obesity, a risk factor for chronic disease.

Value Set: None

Notes: If BMI can be calculated within the EHR, then it is preferable to just received BMI instead of height and weight.

5.2 Weight

Weight of the patient

Core O Cardinality: [0..1]

Rationale: Allows calculation of Body Mass Index (BMI), which may be an indicator of obesity, a risk factor for chronic disease.

Value Set: None

Notes: If BMI can be calculated within the EHR, then it is preferable to just received BMI instead of height and weight.

Risk Factors, Other Factors

6.1 Smoking Status

Smoking status of the patient

Core O Cardinality: [0..1]

Rationale: This data element is a Meaningful Use requirement. Allows monitoring of chronic conditions.

Value Set: TBD

Notes: None

Guidelines for Using Ambulatory Clinical Care EHR Data

Using ambulatory clinical care data with electric syndromic surveillance methods has the potential to provide public health agencies (PHAs) with a more comprehensive picture and awareness of population health throughout the continuum of care. Ambulatory care data provide a view of health seeking behavior for conditions less critical or severe than those found in hospital or urgent care settings, or earlier in the course of illness. This view has the potential to monitor trends in more common but less serious population illnesses, or precursors of more severe illness, may be monitored or assessed. While the belief is that ambulatory clinical care EHR data will serve an important and feasible purpose to PHAs, the amount of added value, given the unavoidable costs and resources necessary to use these data, is still uncertain.

To use these guidelines, PHAs are advised to consider the following as practical approaches:

- Limit ambulatory encounter reporting to office visits in select types of practitioner settings. Adult and/or pediatric primary care settings are best suited to the priority surveillance purposes;
- Limit to a well-defined sample of participating practitioners so that the data can be interpreted as an unbiased estimate for the population covered;
- Limit ambulatory encounter reporting to large practice or integrated health care system settings;
- Explore alternative data reporting and management architecture that will more efficiently utilize ambulatory clinical care data. For example, delegation of data receipt, normalization, and "syndrome" grouping and record sorting tasks to a Health Information Exchange or Data Hub; and
- Leverage existing information management infrastructure and syndromic surveillance processes to on-board and use these data.

Employing best practices during on-boarding and evaluating data quality prior to production are critical to having the capability to interpret these data with confidence.

Regardless of the ambulatory clinical care settings that a PHA may prioritize, the patient encounter data necessary for electronic syndromic surveillance remain the same. For example, patient diagnoses must be provided to group the number of influenza-like-illness encounters together and define the proportion of influenza-like illness (ILI) visits in a clinic. Regardless of where the grouping is performed (whether by the PHA or by a third party), patient diagnosis is necessary for the surveillance purpose. Therefore, these guidelines focus on identifying what a certified EHR needs to extract to support the priority surveillance purposes.

Priority Surveillance Purposes for Ambulatory Settings

EHR technology and reporting ESS data from **ambulatory settings** supports two (2) priority public health surveillance purposes:

1. **Monitor population health** by describing the volume of outpatient visits for high frequency, non-reportable health events;
2. **Inform public health service delivery** by detecting, estimating, and assessing morbidity from possible disease outbreaks or other health events of public health interest; and

These purposes are not meant to be prescriptive or all-inclusive. Rather, given the experience and evidence base, health department resource constraints, national health

priorities, and the demands of Meaningful Use on PHA, these purposes are a priority for health departments interested in using these data. Therefore, national EHR technology certification standards ought to **begin** with a data and reporting model that is suited for these purposes.

In addition to the above two purposes, many PHAs have expressed interest in utilizing ambulatory data for a purpose that includes the increasingly important task of monitoring of chronic disease. This additional purpose is:

3. Inform intervention, policy and health education development and evaluation by describing the burden of chronic disease and health disparities.

Note that these three purposes will be most fully achieved when all eligible practitioners in a jurisdiction are participating, so that the data can be interpreted as an unbiased estimate for the population covered.

PHAs that gather and analyze ambulatory data have a unique opportunity to track growing chronic disease problems with more timely data than current methods. However, at this time the evidence base for syndromic surveillance for this purpose is extremely limited. As a result, this purpose is mentioned as an additional surveillance purpose, and its inclusion will allow PHAs an opportunity to expand current practice.

Contribution to population health monitoring

An integral function of syndromic surveillance systems is supporting population health monitoring, a fundamental and routine epidemiological task. With real-time clinical data from ambulatory clinical care visits, PHAs will gain a more complete picture of the population trends for high-volume, non-reportable conditions.

Specific examples that model how routinely collected ambulatory data have been used to contribute to population health monitoring include:

- Monitoring rates of Lower Respiratory Infection (LRI) to detect outbreaks (Harvard Vanguard Medical Associates, Massachusetts)⁵³; and
- Monitoring rates of gastrointestinal illness to detect and characterize potential outbreaks (Kaiser Permanente Northern California)⁵⁴.

Additional ways stakeholders believe that ambulatory data might be used to contribute to population health monitoring include:

- Monitoring incidence of non-reportable conditions, such as streptococcal pharyngitis (strep throat); and
- Monitoring incidence of influenza-like illness to determine peak influenza season.

Information for public health services

Syndromic surveillance systems serve as an important link to public health services. Ambulatory clinical care data has the potential to support analyses that enhance the ability of PHAs to detect, estimate, and assess the morbidity from possible disease outbreaks or other health events to inform public health action; e.g., public health investigations, interventions and resource management.

Specific examples that model how ambulatory clinical care data have been used to inform public health services include:

- Monitoring the percentage of ambulatory care visits for influenza-like illness (Atrius Health, Massachusetts)⁵⁵.

- Determining where ILI patients first seek care (i.e., ambulatory or ED settings) and characterizing which ILI illnesses are most severe and require hospitalization (Kaiser Permanente, Northern California)⁵⁶.

A specific example that models how ambulatory clinical care data has been used to inform public health services include:

- Predicting future hospitalization rates. Ambulatory visit rates were shown to correlate highly with subsequent hospitalization rates that took place 1-2 weeks later (eastern Massachusetts HMO)⁵⁷.

Stakeholders proposed ways that ambulatory clinical care data might be used to contribute to inform public health services include:

- Monitoring the impact of an incident or event on ambulatory care operations and available resources; and
- Determining rates of high volume reportable conditions, such as Lyme Disease, that have a clinical presentation (*erythema chronicum migrans* rash) that may be under-reported since it is a clinical rather laboratory-based diagnosis. This would allow health departments to monitor the clinical spectrum of disease, more fully assess the overall burden, and provide better insight into its acquisition. This can also assist with informing and evaluating appropriate interventions.

Information for developing and evaluating interventions and developing health education and policy

Periodically, clinical data and subsequent analyses are leveraged for less acute, time-critical purposes, such as when syndromic surveillance systems are used to evaluate interventions or support health education and public health policy activities. Routinely providing ambulatory clinical care data for syndromic surveillance may better support PHAs in their efforts to address priority public health issues including reducing the burden of chronic disease conditions and health disparities on communities.

Specific examples that model how ambulatory clinical care data have been used to inform potential interventions include (some of these may be noted in the introduction section as well):

- Mapping rates of diabetes health care visits by zip code, demographic information, and risk factors (e.g., Atrius Health, Massachusetts)⁵⁸; and
- Characterizing and quantifying the benefits of the ABCDs (Aspirin therapy, Blood pressure monitoring, Cholesterol screening, Diabetes monitoring, Smoking cessation): low cost, priority preventative care interventions (e.g., CDC in partnership with Maine Center for Disease Control and Prevention and HealthInfoNet)⁵⁹.

Stakeholders proposed other ways that ambulatory clinical care data might be used to contribute to population health monitoring including:

- Estimating burden of chronic disease care in the population: number and rate of chronic disease ambulatory care visits (e.g. for hypertension, diabetes, asthma, arthritis, cancer, back pain, etc.);
- Monitoring short-term effectiveness of chronic disease interventions (e.g., smoking ban in bars); and
- Estimating ambulatory care visit rates by geographic area, age, and race and/or ethnicity, as a window on disparities in healthcare access.

Basic Guidelines for Providing ESS Ambulatory Clinical Care Data

The following parameters, or rules, for data senders are basic for the public health surveillance purposes prioritized above. They are also designed to minimize the amount of data a public health agency (PHA) will need to process, analyze and store for these surveillance priorities. Community priorities, however, may demand more than these basic parameters, which may require additional work and resources by both data providers and PHAs.

If a PHA wishes to use these data for purposes other than those prioritized by the ISDS Meaningful Use Workgroup, then these parameters should be adjusted accordingly. For example, more frequent data updates may be required. Regardless, any implementation requires specific rules that must be determined and agreed upon by all parties involved in providing and using these data (e.g., hospital, EHR technology vendor, information brokers, health information exchanges, data receiver, and public health authority). Furthermore, these health data transactions are subject to applicable jurisdictional laws, regulations and policies.

Basic Data Reporting Parameters

Prior to beginning the process of sending ESS ambulatory clinical care data, data senders and data receivers should:

- **Register Treatment Facility Information**

Before sending the electronic syndromic surveillance (ESS) data, information about the treating facility should be recorded by the PHAs receiving the data. Registering these metadata under a unique facility identification number will minimize the size of routinely sent ESS data, and help identify, validate, and assess data transmissions. A process commonly used to establish and maintain syndromic surveillance data sharing partnerships, including facility registration, is detailed in the 2011 ISDS Recommendation Report⁶⁰.

The metadata captured during registration should minimally include the following:

- Treatment Facility Name
- Treatment Facility Location / Address
- Unique Treatment Facility Identifier
- Umbrella Organization, if applicable
- Treatment Facility Type or Specialty

As state and regional health information exchange organizations develop, additional registration information may be required to ensure that PHAs can contact clinical data sources and document data provenance.

- **Determine protocols to securely provide electronic syndromic surveillance (ESS) data to PHA**

The data sender and PHA must determine how the data will be securely provided by electronic means. Since these will largely be new connections, it is especially important that data providers and PHAs work together to implement the best solution transporting these data.

ESS ambulatory clinical care data providers should:

- **Provide or report ESS data to PHA at least once in a 24 hour period**

ESS ambulatory clinical care data should be routinely provided, reported, transmitted or sent to PHAs. **The frequency of this routine should, at a minimum, be at least once every 24 hour period every day the clinic is operated** (Figure 4). All ESS data elements should be sent each time data are reported. As mentioned above, PHAs may require a more frequent reporting routine (e.g., two times every 24 hours).

- **Provide ESS data for all face-to-face clinical encounters**

Senders should provide records for every patient who is seen within the treatment facility since the last time ESS data were reported, transmitted or sent to the PHA (Figure 4). In others words, ESS data on all office visits during a reporting period should be sent. Applicable public health jurisdictional laws, policies and practices may further constrain or extend these ESS data to other clinical encounters (e.g., exclude only well-patient visits, or also include telemedicine encounters).

- **Provide with each ESS record, de-identified data that can be securely used to lookup additional information about a patient visit of public health interest or concern**

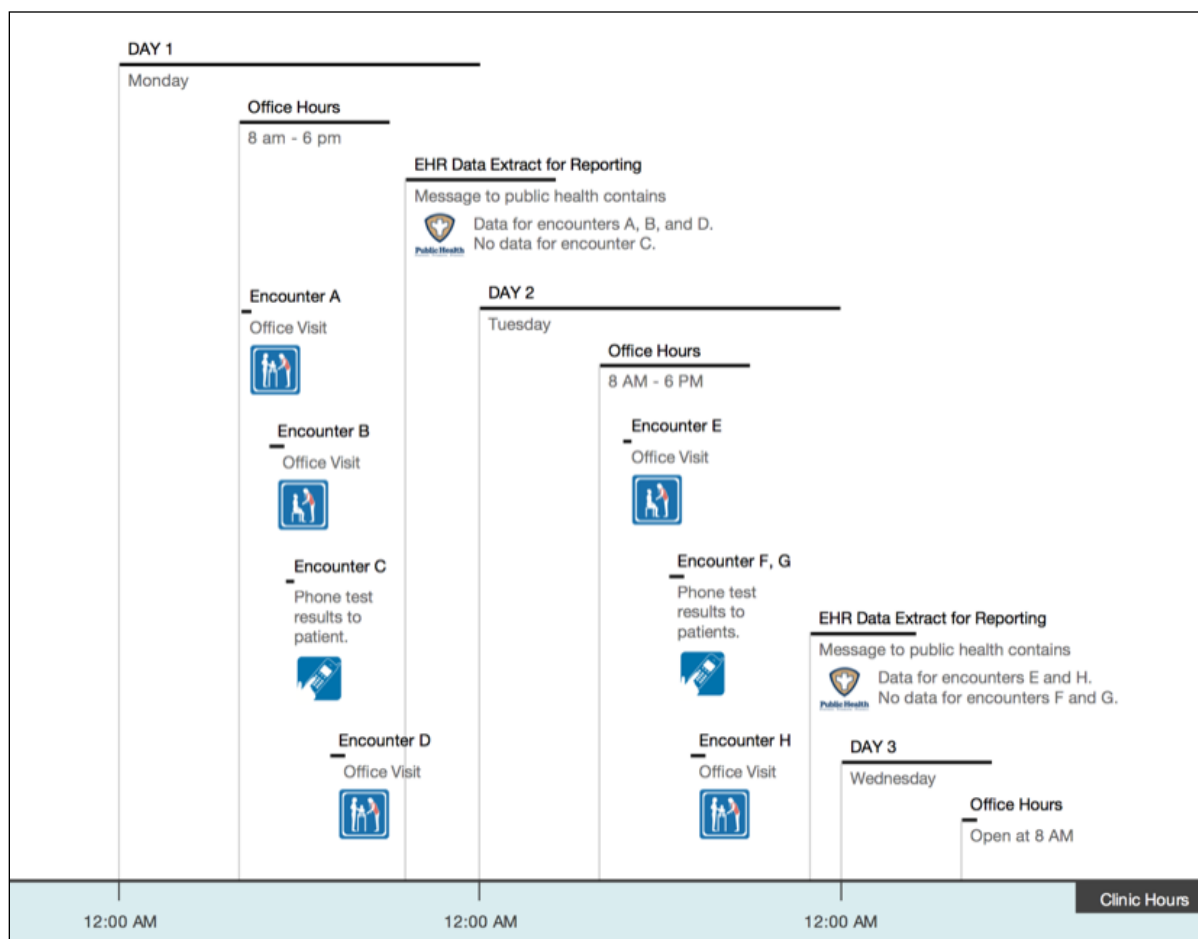
Senders should provide data (e.g., a record identifier) with all ESS records that enable PHAs to work with healthcare providers in finding additional visit information for syndromic surveillance signal confirmation or investigation. This is a syndromic surveillance task that is critical to ensuring public health actions are triggered by authentic and valid surveillance anomalies or alerts. A Visit ID or Patient ID, a core data element of interest discussed below, is maybe used to fulfill this requirement.

Under applicable jurisdictional laws, policies and practices, PHAs may require or request personally identifiable information for syndromic surveillance.

PHAs, or their designated receivers of ESS ambulatory clinical care data should:

- If ESS data are desired more frequently than once every 24 hours, then the desired frequency should be specified to data providers.
- If record updates are desired, determine the clinical or administrative actions that will trigger the update.
- If a subset or superset of ambulatory clinical care records is desired, determine the clinical or administrative actions that define the record set.
- If the ability to longitudinally link visit records by patient is desired, as may be necessary for chronic disease surveillance purposes, require a pseudonymous patient identifier for each visit record that uniquely distinguish a patient from all other patients treated by a single facility, institution or within a healthcare system. A master patient index (MPI) identifier will only allow linkage of visits for an individual to a single institution. A regional MPI or some other mechanism is necessary to allow population surveillance of chronic diseases.

Figure 4: Graphic depiction of the basic parameter for electronic syndromic surveillance (ESS) data provision from ambulatory clinical settings to a public health authority. ESS data should be routinely provided at least once every 24 hour period, at a minimum, everyday the clinic is operated. All ESS data elements should be sent each time data are provided. These parameters are subject to change based on existing or future local and state laws.



Core Data Elements of Interest

The following ambulatory data elements are core to fulfilling the public health surveillance purposes prioritized above (Summary Table A). These data do not support the full spectrum of practice. Data elements and their specifications are subject to applicable local and state laws and practices.

In addition to supporting the priority surveillance purposes, the core data elements were selected by the workgroup met the following criteria:

- Data are collected as part of routine clinical work.
- Collection minimizes the impact of public health surveillance on clinic care.
- Extraction of the element from electronic medical record databases is technically feasible.
- The extraction functionality is economical and does not negatively impact healthcare provider workflow for providers and does not make reporting cost prohibitive.

The ISDS Workgroup's rationale and thoughts regarding each element are presented along with detailed guidelines below. In addition to a name, description, cardinality and possible code sets or vocabularies, data usages for PHAs are provided. These usages are defined as follows:

Data Usages

R - Required

The data element will always be provided from hospital systems, and public health data receiving systems must be configured to receive and process the element.

RE - Required, but may be sent empty

The data element will always be provided from hospital systems if and only if it is collected, and public health data receiving systems must be configured to receive and process the element.

O - Optional

The PHA needs to let data providers or senders know whether or not the element must be sent, and receiving systems configured accordingly.

Ambulatory data elements for syndromic surveillance that are an extension of the core or for future consideration are presented and discussed in Appendix 2.

Ambulatory: Core Data Set - Detailed Data Definitions

Basic Message Information

8.1 Facility Identifier (Treating)

Unique facility identifier of facility where the patient is treated (original provider of the data)

Core R Cardinality: [1..1]

Rationale: Provides identification of where the patient is treated

Value Set: National Provider Identifier

- Notes:
- Use facility identifier for state or local reporting only. This is due to agreements with many health data providers that explicitly state that states or localities will not expose them to a third party like the federal government when reporting above state level.
 - This number should be specific for each facility location (not a number representing an umbrella business).
 - It is recommended that National Provider Identifier (NPI) be used for the Facility Identifier.

8.2 Facility Name (Treating)

Name of the treating facility where the patient is treated

Core O Cardinality: [0..1]

- Rationale: Provides identification of where the patient is treated
- Value Set: Free text
- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

8.3 Facility Street Address (Treating)

Street address of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: Free text

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

8.4 Facility City (Treating)

City of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: Free text

- Notes:
- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
 - This data element captures data for the treating facility where the patient is treated.

8.5 Facility ZIP Code (Treating)

ZIP Code of treating facility location

Core O Cardinality: [0..1]

Rationale:	Helps characterize spatial -temporal patterns for analysis based on where the patient is treated
Value Set:	USPS
Notes:	- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration. - This data element captures data for the treating facility where the patient is treated.

8.6 Facility County (Treating)

County of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: FIPS 6-4

Notes:

- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
- This data element captures data for the treating facility where the patient is treated.

8.7 Facility State (Treating)

State of treating facility location

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on where the patient is treated

Value Set: FIPS 5-2. Use numeric codes.

Notes:

- This data element is optional because if this data element is captured and maintained as part of the facility registration process, it may not be necessary to send this data element with every message. See section describing Facility Registration.
- This data element captures data for the treating facility where the patient is treated.

8.8 Message Date/Time

Date and time that the report is created / generated from original source (from treating facility)

Core R Cardinality: [1..1]

Rationale: Key element for managing the data

Value Set: None

Notes: If data flows through an intermediary or third party, the intermediary must keep the original date/time of report creation / generation.

8.9 Unique Patient / Visit Identifier

Unique identifier for the patient or visit

Core R Cardinality: [1..*]

Rationale: Provides the ability for PHA to conduct reach-back if necessary

Value Set: HL7 Table 0203. <http://phinvads.cdc.gov/vads/ViewValueSet.action?id=0B1911BC-E324-E011-B71B-00188B39829B>

Notes:

- Data providers and PHAs should determine which unique identifier(s) will be sent in accordance with applicable local and state laws for the purpose of conducting reach-back if necessary. Examples of identifiers are unique visit identifiers or unique patient identifiers, such as medical record numbers, or account numbers. Identifiers may be pseudonymized by replacing identifying fields within a data record with artificial identifiers to protect patient privacy.
- Pseudonymization of the patient identifier may be used to enable data senders to protect patient privacy and still allow re-identification of records upon request of the PHAs if reach-back is necessary. Pseudonymization is the process by which identifying fields within a data record are replaced by artificial identifiers.
- If the sender and receiver agree to support record linkage (of patient records across multiple encounters), a Unique Patient Identifier should be used that will allow the matching and linking of a patient's records across multiple encounters.

Demographics

9.1 Age

Numeric value of patient age at time of visit

Core RE Cardinality: [0..1]

Rationale: Provides information about the affected population. Age is RE since there may be instances (i.e. unconsciousness) where patients cannot provide the information needed for this field.

Value Set: None

Notes: In order for age to be de-identified, age must be rounded to an integer.

- For patient age greater than or equal to ($\geq$) 2 years old, report in whole years.
 - Truncate age to integer. For example, 16.75 years = 16 years old
- For patients less than ($<$) 2 years old:
 - Report the age in integer months. Do not report days or weeks.
 - Truncate month to integer. For example, 5 months and 20 days = 5 months

9.2 Age units

Unit corresponding to numeric value of patient age

Core RE Cardinality: [0..1]

Rationale: Identifies the unit for the age value

Value Set: UCUM Age Units

Notes: Unit value should be “Year” for patient greater than or equal to ($\geq$) 2 years old. Unit value should be “Months” for patients less than ($<$) 2 years old.

9.3 Gender

Stated gender of patient

Core RE Cardinality: [0..1]

Rationale: Helps to characterize the outbreak / condition of interest by person/place/time that may be affected by this social determinant

Value Set: Value Set: CDC Gender (Syndromic Surveillance) Value Set: <http://phinvads.cdc.gov/vads/ViewValueSet.action?id=6358110D-9517-E011-87A0-00188B39829B>.

Values include:

- F = Female
- M = Male
- O = Other
- U = Unknown

Notes: None

9.4 Race

Race of patient

Core RE Cardinality: [0..*]

Rationale: Helps to characterize the outbreak / condition of interest by person/place/time that may be affected by this social determinant

Value Set: CDC Race Category Value Set: <http://phinvads.cdc.gov/vads/ViewValueSet.action?id=67D34BBC-617F-DD11-B38D-00188B398520>.

Values include:

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Other Race

Notes: None

9.5 Ethnicity

Ethnicity of patient

Core RE Cardinality: [0..*]

Rationale: Helps to characterize the outbreak / condition of interest by person/place/time that may be affected by this social determinant

Value Set: CDC Ethnicity Group Value Set: <http://phinvads.cdc.gov/vads/ViewValueSet.action?id=35D34BBC-617F-DD11-B38D-00188B398520>.

Values include:

- Hispanic or Latin
- Not Hispanic or Latino

Notes: None

9.6 Patient City / Town

City or town of patient residence

Core RE Cardinality: [0..1]

Rationale: Helps characterize spatio-temporal patterns for analysis based on patient's residence. Potential proxy to identify socio-economic disparities. Can identify out of state patients for treatments/conditions. This data element is RE to allow for differences in geographical characterization between jurisdictions (i.e., some states operate public health activities on a county level, others on a city/town level, etc.). By making City/Town, ZIP and County all Core (RE), PHAs will have access to the necessary geographic information.

Value Set: Free text

Notes: None

9.7 Patient ZIP Code

ZIP Code of patient residence

Core RE Cardinality: [0..1]

Rationale: Helps characterize spatio-temporal patterns for analysis based on patient's residence. Potential proxy to identify socio-economic disparities. Can identify out of state patients for treatments/conditions. This data element is RE to allow for differences in geographical characterization between jurisdictions (i.e., some states operate public health activities on a county level, others on a city/town level, etc.) By making City/Town, ZIP and County all Core (RE) PHAs will have access to the necessary geographic information.

Value Set: USPS

Notes: Provide 5 digits for domestic ZIP Code. Foreign postal codes should be supported.

9.8 Patient County

County of patient residence

Core RE Cardinality: [0..1]

Rationale: County helps to further target spatio-temporal patterns since ZIP Code can cross multiple counties. This data element is RE to allow for differences in geographical characterization between jurisdictions (i.e., some states operate public health activities on a county level, others on a city/town level, etc.) By making City/Town, ZIP and County all Core (RE) PHAs will have access to the necessary geographic information.

Value Set: FIPS 6-4

Notes: None

9.9 Patient State

State of patient residence

Core O Cardinality: [0..1]

Rationale: Helps characterize spatial-temporal patterns for analysis based on patient's residence. It is also a readily available data element that is useful if other patient location data elements are not available.

Value Set: FIPS 5-2. Use numeric code

Notes: None

9.10 Patient Country

Country of patient residence

Core O Cardinality: [0..1]

Rationale: There are some foreign countries that use 5 digit zip codes, so country is needed to help identify if patient is international.

Value Set: ISO 3166-1. Country Value Set. Use 3 character codes

Notes: None

Visit Information

10.1 Chief Complaint / Reason for Visit

Short description of the patient's self-reported chief complaint or reason for visit

Core RE Cardinality: [0..*]

Rationale: Helps identify conditions of public health concern.

Value Set: Free text (Preferred)
Or ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)
Or SNOMED Disorder/ Disease domain

- Notes:
- This field is the patient's **self-reported** chief complaint or reason for visit. It is distinct from the Encounter Reason field, which is the **provider's initial assessment** of why the patient encounter is occurring.
 - Senders should send the richest and most complete description of the patient's chief complaint.
 - If both the free text chief complaint text and drop down selection chief complaint text are available, send both.
 - If the chief complaint is available only from drop down list fields, then concatenate all drop down list chief complaints selected for that record/visit and submit.
 - Some systems may automatically overwrite chief complaint with final diagnosis when the final diagnosis code is assigned. The chief complaint text should NOT be replaced with other information either manually or by the data provider's system. Keep the chief complaint the same as how it was captured at time of admission.

10.2 Encounter Reason

Short description of provider's initial assessment of why the patient encounter is occurring

Core RE Cardinality: [0..*]

Rationale: Helps identify conditions of public health concern. This field is a counterpart to the chief complaint fields for ED.

Value Set: ICD-9 or -10 Clinical Modification diagnosis code
Or SNOMED Disorder/ Disease domain
Or Free Text

- Notes:
- This field is the **provider's initial assessment** of why the patient encounter is occurring. It is distinct from the Chief Complaint / Reason for Visit field which is the patient's **self-reported** chief complaint or reason for visit.
 - Senders should send the richest and most complete description of the patient's reason for encounter. If both free text and drop down selection text are available, send both. If only drop down list fields are available, then concatenate all drop down list values selected and submit.

10.3 Encounter Date/Time

Date and time of encounter

Core R Cardinality: [1..1]

Rationale: Helps identify temporal patterns

Value Set: None

Notes: None

10.4 Patient Class

Patient classifications within facility

Core R Cardinality: [1..1]

Rationale: Used to identify which data stream (setting) the record is coming from.

Value Set: Constrained HL7 Table 004: <https://phinvads.cdc.gov/vads/ViewValueSet.action?id=2E275396-9717-E011-87A0-00188B39829B>.

Values include:

- E: Emergency
- I: Inpatient
- O: Outpatient

Notes: May be useful to limit values to O: Outpatient. Likely only relevant in mixed care environments where there are different types of care settings within one facility.

Diagnostic and Pre-Diagnostic

11.1 Primary Diagnosis

Primary diagnosis of the patient's condition

Core RE Cardinality: [0..1]

Rationale: Identifies which diagnosis is the main diagnosis to help identify conditions of public health concern

Value Set: ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)
Or SNOMED Disorder/ Disease domain
Or Free Text

- Notes:
- Diagnosis from the provider (EHR) is preferred over the diagnosis provided through billing
 - Include V-codes and E-codes. When the primary diagnosis code is an injury, also provide one or more supplemental external-cause-of-injury codes or E-codes. E-codes provide useful information on the mechanism and intent of injury, place of occurrence, and activity at the time of injury.
 - When sending data, Primary Diagnosis and Additional Diagnosis may be reported using the same data field. The data elements are separated in the Guidelines in order to distinguish the PHA use/significance between the two data elements.

11.2 Additional Diagnosis

Additional diagnoses of the patient's condition(s)

Core RE Cardinality: [0..*]

Rationale: Identifies other diagnoses to help identify conditions of public health concern

Value Set: ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)
Or SNOMED Disorder/ Disease domain
Or Free Text

- Notes:
- Diagnosis from the provider (EHR) is preferred over the diagnosis provided through billing.
 - Include V-codes and E-codes. When the primary diagnosis code is an injury, also provide one or more supplemental external-cause-of-injury codes or E-codes. E-codes provide useful information on the mechanism and intent of injury, place of occurrence, and activity at the time of injury.
 - When sending data, Primary Diagnosis and Additional Diagnosis may be reported using the same data field. The data elements are separated in the Guidelines in order to distinguish the PHA use/significance between the two data elements.

Vitals

12.1 Height

Height of the patient

Core O Cardinality: [0..1]

Rationale: Allows calculation of Body Mass Index (BMI), which maybe be an indicator of obesity for chronic disease. **Note:** If BMI can be calculated within the EHR, then it is preferable to just receive BMI instead of height and weight.

Value Set: None

Notes: None

12.2 Weight

Weight of the patient

Core O Cardinality: [0..1]

Rationale: Allows calculation of Body Mass Index (BMI), which maybe be an indicator of obesity for chronic disease. **Note:** If BMI can be calculated within the EHR, then it is preferable to just receive BMI instead of height and weight.

Value Set: None

Notes: None

12.3 Systolic and Diastolic Blood Pressure (SBP/DBP) - Most Recent

Most recent systolic and diastolic blood pressure of the patient. Most recent is the blood pressure taken most closely to the time that message is constructed/assembled

Core O Cardinality: [0..1]

Rationale: Allows monitoring of chronic conditions.

Value Set: None

Notes: None

Risk Factors, Other Factors

13.1 Smoking Status

Smoking status of the patient

Core O Cardinality: [0..1]

Rationale: This data element is a Meaningful Use requirement. Allows monitoring of chronic conditions.

Value Set: TBD

Notes: None

Conclusions



Conclusions

In the U.S., syndromic surveillance systems were initially developed within public health agencies for public health preparedness and emergency response. Early disease or outbreak detection was the priority surveillance purpose driving surveillance system design and health data partnerships. As early adopters established data connections with hospital emergency departments (ED) and, later, urgent care settings (UC), they had to maintain expectations of data utility, while also acknowledging the breadth of unknowns with the new data source⁶¹.

Over the decade since syndromic surveillance systems were initiated with ED and UC data, the value of these data to public health is well established⁶², so much so that the public health community as a part of Meaningful Use has defined national standards⁶³. Syndromic surveillance processes are now routinely used to aid in surveillance purposes beyond early disease detection, particularly the timely monitoring of the population impact of already-recognized health events. Health agencies are also increasingly turning to ESS data for analyses that are less time sensitive than the demands of an emergency response, e.g., monitoring trends in bicycle injuries⁶⁴ or the effects of pollen on asthma-related ED visits⁶⁵.

Based on their findings and the guidelines detailed in this report, the ISDS Meaningful Use Workgroup concludes that the following health information technology policies, community activities and additional investments will best support public health agencies in using electronic health record technology with syndromic surveillance methodologies:

1. The meaningful use of electronic syndromic surveillance from eligible healthcare professionals and hospitals is attained through the following sequence of proven, best practice steps:
 - 1.1. Step 1: Successful submission of valid test data from a new data source to public health;
 - 1.2. Step 2: Successful on-going submission of data to public health for pre-production processing and testing; and
 - 1.3. Step 3: On-going data submission to public health and full integration of the data into routine surveillance reports and agency activities.
2. For Meaningful Use Stage 3 requirements, the Centers for Medicare and Medicaid (CMS) should:
 - 2.1. Retain electronic syndromic surveillance reporting as a core objective for eligible hospitals. Hospitals already must report data for patients in the Emergency Department setting. Upon request of the public health agency hospitals must also report inpatient data to support local syndromic surveillance practice, pilots, or demonstration projects as authorized by law, regulation, agreement, etc.; and
 - 2.2. Retain electronic syndromic surveillance reporting as an optional objective for eligible professionals to support local syndromic surveillance practice, pilots, or demonstration projects as authorized by law, regulation, agreement, etc.
3. For the next edition of the EHR Certification Criterion for electronic syndromic surveillance, the Office of the National Coordinator for Health Information Technology (ONC) should ensure that:

- 3.1. Certified EHRs for hospital or urgent care settings demonstrate an ability to support all core data elements for the ED and inpatient settings; and
- 3.2. Certified EHRs for ambulatory or outpatient settings demonstrate an ability to support the core data elements for the ambulatory setting.
4. CMS and ONC should take action to encourage EHR vendors, hospitals and ambulatory practitioners to implement systems that can capture and transmit the identified extended data elements for inpatient and ambulatory clinical care settings (Figure 5)
5. A multi-disciplinary public health surveillance workgroup (e.g., syndromic surveillance data analysts, infectious disease, chronic disease, environmental health, and occupational health epidemiologists, performance management experts, and informaticians) should be formed and charged with using de-identified/limited electronic health data from EHRs for expanded surveillance purposes to:
 - 5.1. Define the scope of non-infectious disease syndromic surveillance and document business and data requirements;
 - 5.2. Describe the scope and uses of ambulatory care and inpatient data for infectious and non-infectious disease syndromic surveillance;
 - 5.3. Describe the use and define the scope and reporting parameters of laboratory data to support infectious and non-infectious disease syndromic surveillance; and
 - 5.4. Define objectives, methods, tools, and evaluation procedures for demonstration projects.
6. Funds for demonstration projects are recommended to define the opportunities and barriers associated with using inpatient and ambulatory EHR data for public health surveillance and response. Specific areas for investigation and/or evaluation include:
 - 6.1. Public health uses beyond influenza-like illness and disaster response; e.g., chronic disease monitoring, injury surveillance; and
 - 6.2. Benchmarking the added value of these data sources as compared to current surveillance systems; e.g., syndromic ambulatory clinical care reporting versus Behavioral Risk Factor Surveillance System. Assessments that address validity, timeliness and cost are needed.
7. These recommendations and guidelines should be revisited and updated by September 2015 or at such a time that use of these data has grown more prevalent among health departments and their utility better understood.

As with all innovations resulting from paradigm shifts, how the opportunities for public health surveillance created by Meaningful Use are used in public health practice will evolve over time. Computing and health information technologies will advance, lessons will be learned, and novel methods will be discovered that will affect the balance between the effort required to provide the health data and their public health utility. Indeed, the history of syndromic surveillance in the United States is a reflection of this course. Whereas emergency department health data were initially sought for bioterrorism preparedness, present day public health priorities will determine why public health agencies begin to use inpatient and ambulatory clinical care health data. With time and experience, public health will use these newly available data sources for far more than influenza-like illness surveillance and improve public and population health in exciting and unforeseeable ways.

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Appendix



Appendix

Appendix 1: Hospital Inpatient Extended and Future Data Elements

Appendix 2: Ambulatory Extended and Future Data Elements

Appendix 3: Glossary of Terms

Appendix 4: Meaningful Use Workgroup Biographies

Appendix 5: References

Appendix 1: Hospital Inpatient Extended and Future Data Elements

Hospital Inpatient: Extended Data Set - Detailed Data Definitions

The following section provides detailed descriptions of the set of hospital inpatient extended data elements. These elements were selected as extended because they are of importance to public health, are collected as part of routine clinical work, and can be extracted from an EHR. Additionally, they support, but are not required, to carry out the identified priority surveillance purposes for inpatient data. Although there are benefits, the extraction and sending of these data elements poses technical challenges. The burden on PHAs to use and analyze this data may also be high. In order to balance the feasibility and utility considerations, these data elements are recommended as optional for syndromic surveillance and are not required for support by an EHR system for certification purposes. The receiver usage for all these data elements is optional.

Vitals

5.3 Initial Temperature

Initial temperature of the patient

Extended O Cardinality: [0..1]

Rationale: A routinely collected data element that may help provide indication of conditions of public health interest and severity. Data element is categorized as extended because there are mixed opinions as to the usefulness of this data element to PHA and whether the PHA would want/use it.

Value Set: None

Notes: None

5.4 Systolic and Diastolic Blood Pressure (SBP/DBP) - Most Recent

Most recent systolic and diastolic blood pressure of the patient. Most recent is the blood pressure taken most closely to the time that message is constructed/assembled. Given the clinical context and number of readings taken in the Inpatient setting, use and interpretation must be further explored.

Extended O Cardinality: [0..1]

Rationale: Allows monitoring of chronic conditions.

Value Set: None

Notes: None

Lab, Procedures

7.1 Procedure Code

Procedures administered to the patient

Extended O Cardinality: [0..*]

Rationale: Used to gauge severity. Data element is categorized as extended due to the large volume of data that may burden PHA without fully understanding the usefulness of the data provided. The number of procedures per patient per hospital stay is anticipated to be large. It is unlikely that this would routinely be used for initial patient-based syndromic analyses, and may be an element needed for more detailed follow-up analyses or patient level investigation.

Value Set: Current Procedure and Terminology-4

Or Free Text

Notes: None

Hospital Inpatient: Future Data Set - Detailed Data Definitions

The following section provides detailed descriptions of the set of hospital inpatient future data elements. These elements were selected as future because they have potential value to the identified inpatient priority surveillance purposes. However, the elements were not deemed technically feasible nor of high enough utility for the majority of PHAs **at this time**. Acknowledging public health practice and health information technologies are continuously evolving, the Workgroup believes that these elements will likely be of greater public health importance in the future. As a result, these data elements are listed for future consideration and do not require support by the EHR system for EHR certification.

Diagnostic and Pre-Diagnostic

4.7 Problem List

Problem list of the patient condition(s)

Future

Rationale: Can provide co-morbidity, pregnancy status, and indications of severity and chronic disease conditions, and medical and surgical histories. Data element is categorized as future because there potentially may be a large quantity of data that needs management and may add burden to PHA without fully understanding the usefulness of the data provided. This data element may or may not be structured data. There are no requirements or business rules for documenting or maintaining the list (e.g., pregnancy – current or previous). Problem list may not be applicable to the inpatient setting but still requires further exploration.

Value Set: ICD-9 or -10 Clinical Modification diagnosis code (including E-codes and V-codes)

Or SNOMED Disorder/ Disease domain

OR Free Text

Notes: None

Vitals

5.5 Initial Pulse Oximetry

Patient's first reported pulse oximetry value

Future

Rationale: Data element categorized as future because more research is needed to understand the usefulness of this data element and whether PHAs are using this. This may have more relevance with individual case investigation (e.g., SARS)

Value Set: None

Notes: None

Risk Factors, Other Factors

6.2 Occupation, Industry

Occupation/Industry of the patient

Future

Rationale: Occupation is not currently collected as a standard, discrete data element and is not collected as a routine part of the clinical workflow. The use and interpretation of this data element by PHAs must be further defined before recommending the changing of clinical workflow and potentially increasing the burden on direct care providers to collect and PHAs to use the data.

Value Set: TBD

Notes: None

6.3 Insurance Coverage

The type of insurance coverage that the patient carries

Future

Rationale: Suggested to help indicate socioeconomic status and may also be used to identify occupation-related patient encounters. Data element is categorized as future because providing accurate information would increase the burden on data providers and may not necessarily be useful to PHAs. Data providers may also be reluctant to provide this information due to some identifying qualities of this data.

Value Set: TBD

Notes: None

Lab, Procedures

7.2 Lab Orders

Lab tests ordered for the patient

Future

Rationale: Provides data about the patient's condition to help identify conditions of interest for ESS. Data set is categorized as future because collecting all lab orders for all patients is anticipated to be large in number. The relevance of all data, routine use, analysis and interpretation, especially with an unfiltered approach, is not clear at this time. Collection of this data may be relevant to more in-depth analyses, individual patient follow-up or other surveillance process (e.g., lab-based surveillance).

Value Set: TBD

Notes: TBD

7.3 Lab Results

Lab results for the patient

Future

Rationale: Provides data about the patient's condition to help identify conditions of interest for ESS. Data set is categorized as future because collecting all lab results for all patients is anticipated to be large in number. The relevance of all data, routine use, analysis and interpretation, especially with an unfiltered approach, is not clear at this time. Collection of this data may be relevant to more in-depth analyses, individual patient follow-up or other surveillance process (e.g., lab-based surveillance).

Value Set: TBD

Notes: TBD

7.4 Medications Prescribed or Dispensed

Medications prescribed or dispensed to the patient

Future

Rationale: Data element is categorized as future because more understanding is needed on the usefulness of the data provided. Collecting all medications prescribed or dispensed for all patients is anticipated to be large in number. The relevance of all data, routine use, analysis and interpretation, especially with an unfiltered approach, is not clear at this time. Collection of this data may be relevant to more in-depth analyses, individual patient follow-up or other surveillance process.

Value Set: TBD

Notes: TBD

Appendix 2: Ambulatory Extended and Future Data Elements

Ambulatory: Extended Data Set - Detailed Data Definitions

The following section provides detailed descriptions of the set of extended ambulatory data elements. These elements were selected as extended because they are of importance to public health, are collected as part of routine clinical work, and can be extracted from an EHR. Additionally, they support, but are not required, to carry out the identified priority surveillance purposes for inpatient data. Although there are benefits, the extraction and sending of these data elements poses technical challenges. The burden on PHAs to use and analyze this data may also be high. In order to balance the feasibility and utility considerations, these data elements are recommended as optional for syndromic surveillance and are not required for support by an EHR system for certification purposes. The receiver usage for all these data elements is optional.

Basic Message Information

8.11 Unique Physician Identifier

Unique identifier for the physician providing care

Extended O Cardinality: [0..1]

Rationale: May simplify the process of determining which eligible professionals have satisfied the syndromic surveillance reporting option. Data element is categorized as extended because it is not essential to the priority syndromic surveillance purposes and may not necessarily be used widely at this time. Future changes in meaningful use requirements or Medicare and Medicare reimbursement requirements may impact the availability of this element.

Value Set: National Provider Identifier

Notes: None

Vitals

12.1 Initial Temperature

Initial temperature of the patient

Extended O Cardinality: [0..1]

Rationale: A routinely collected data element that may help provide indication of conditions of public health interest and severity. Data element is categorized as extended because there are mixed opinions as to the usefulness of this data element to PHAs and whether PHAs would want/use it.

Value Set: None

Notes: None

Ambulatory: Future Data Set - Detailed Data Definitions

The following section provides detailed descriptions of the set of ambulatory future data elements. These elements were selected as future because they have potential value to the identified inpatient priority surveillance purposes. However, the elements were not deemed technically feasible nor of high enough utility for the majority of PHAs **at this time**. Acknowledging public health practice and health information technologies are continuously evolving, the Workgroup believes that these elements will likely be of greater public health importance in the future. As a result, these data elements are listed for future consideration and not required for EHR certification.

Diagnostic and Pre-Diagnostic

11.4 Problem List

Problem list of the patient condition(s)

Future

Rationale: Can provide co-morbidity, pregnancy status, and indications of severity and chronic disease conditions. Data element is categorized as future because there potentially may be a large quantity of data that needs management and may add burden to PHAs without fully understanding the usefulness of the data provided. This data element may or may not be structured data. There are no requirements or business rules for documenting or maintaining the list (e.g., pregnancy – current or previous).

Value Set: Or SNOMED Disorder/ Disease domain

Notes: Value set selection is aligned with current Meaningful Use standards

Risk Factors, Other Factors

13.2 Occupation, Industry

Occupation/Industry of the patient

Future

Rationale: Clinicians were concerned about the current quality of these data is insufficient for how public health would like to use them. Although the importance of occupational health has been articulated by the IOM, there are no documented clinical and public health use cases to justify routine collection in clinical work.

Value Set: TBD

Notes: None

13.3 Insurance Coverage

Health insurance coverage of the patient

Future

Rationale: Suggested to help indicate socioeconomic status and may also be used to identify occupation-related patient encounters. Data element is categorized as future because providing accurate information would increase the burden on data providers and may not necessarily be useful to PHAs. Data providers may also be reluctant to provide this information due to some identifying qualities of this data.

Value Set: TBD

Notes: None

Lab, Procedures

14.1 Lab orders

Lab tests ordered for the patient

Future

Rationale: Provides data about the patient's condition to help identify conditions of interest for ESS. Data set is categorized as future because collecting all lab orders for all patients is anticipated to be large in number. The relevance of all data, routine use, analysis and interpretation, especially with an unfiltered approach, is not clear at this time. Collection of this data may be relevant to more in-depth analyses, individual patient follow-up or other surveillance process (e.g., lab-based surveillance).

Value Set: TBD

Notes: TBD

14.2 Lab Results

Lab results for the patient

Future

Rationale: Provides data about the patient's condition to help identify conditions of interest for ESS. Data set is categorized as future because collecting all lab results for all patients is anticipated to be large in number. The relevance of all data, routine use, analysis and interpretation, especially with an unfiltered approach, is not clear at this time. Collection of this data may be relevant to more in-depth analyses, individual patient follow-up or other surveillance process (e.g., lab-based surveillance).

Value Set: TBD

Notes: None

14.3 Medications Prescribed or Dispensed

Medications prescribed or dispensed to the patient

Future

Rationale: Data element is categorized as future because more understanding is needed on the usefulness of the data provided. Collecting all medications prescribed or dispensed for all patients is anticipated to be large in number. The relevance of all data, routine use, analysis and interpretation, especially with an unfiltered approach, is not clear at this time. Collection of this data may be relevant to more in-depth analyses, individual patient follow-up or other surveillance process.

Value Set: TBD

Notes: TBD

Appendix 3: Glossary of Terms

Ambulatory care: Ambulatory care is provided on an outpatient basis. For the purposes of this recommendation, ambulatory care refers to primary care offices and other outpatient care settings (e.g., OB/Gyn, cardiologist, etc.).

Business Process: A collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers¹.

Collaborative: When two or more organizations join and work together, share knowledge and expertise, and build consensus toward meeting common goals.

Direct: A secure, scalable, standards-based way to establish universal health addressing and transport for participants (including providers, laboratories, hospitals, pharmacies and patients) to send encrypted health information directly to known, trusted recipients over the Internet. For more information see: <http://wiki.directproject.org/>

Electronic Health Record (EHR): A systematic collection of electronic health information about patients or populations².

Electronic Health Record System (EHR-S): An organized infrastructure for the collection of Electronic Health Record information.

Eligible Professional (EP): Eligible professionals are defined separately for Medicaid and Medicare.

See: https://www.cms.gov/EHRIncentivePrograms/15_Eligibility.asp#TopOfPage for more information.

Health: According to the World Health Organization, health is: a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity³.

Health Information Exchange (HIE): Organizations that provide a mechanism for the sharing of clinical and administrative healthcare data among healthcare institutions, providers, and data repositories.

HTTPS POST: Hyper-text transfer protocol, secured using the POST method. The POST request method is used when the client needs to send data to the server as part of the request, such as when uploading a file or submitting a completed form. (Source: Wikipedia)

Inpatient care: Inpatient care, in contrast to ambulatory care, occurs upon admission to a hospital or health care facility. Therefore, information from inpatient electronic health records will generally offer information on illness and injury severity.

Limited data set: Health information in a limited data set is not directly identifiable, but may contain information that does not meet HIPAA criteria for de-identified data. A data-use agreement must establish who is permitted to use or receive the limited data set and stipulate lawful uses of the data.

MLLP: A large portion of HL7 messaging is transported by Minimal Lower Layer Protocol (MLLP), also known as Lower Layer Protocol (LLP). For transmitting via TCP/IP, header and trailer characters are added to the message to identify the beginning and ending of the message because TCP/IP is a continuous stream of bytes. (Source: Wikipedia)

1 Lee LM, Teutsch SM, Thacker SB, St. Louis ME. 2009. Principles and Practice of PUBLIC HEALTH SURVEILLANCE, 3rd Ed. Oxford University Press: New York. (p. 69).

2 Gunter TD, Terry NP. The Emergence of National Electronic Health Record Architectures in the United States and Australia: Models, Costs, and Questions. J Med Internet Res 2005;7(1):e(3).

3 World Health Organization. Frequently Asked Questions: What is the WHO definition of health? 2012. <http://www.who.int/suggestions/faq/en/>.

PHINMS: The Public Health Information Network Messaging System (PHINMS) is a Center for Disease Control and Prevention developed implementation of existing standards for the secure and reliable transmittal of messages across the Internet. This system was developed for the purpose of secure and reliable Messaging over the Internet. This software has been widely deployed by CDC and its public health partners; including state health departments, local health departments, and healthcare providers. PHINMS is designed to leverage X.509 Digital Certificates issued by the public key infrastructures, but does not require a single, universal Public Key Infrastructure (PKI). (Source: <https://sites.google.com/site/cdcphinms/about/project-definition>)

Population Health: The health outcomes of a group of individuals, including the distribution of such outcomes within the group; this grouping includes health outcomes, patterns of health determinants, and policies and interventions that link the two⁴.

Program: An organized set of projects and services intended to meet a public need. Programs often establish policy and may develop and recommend interventions. Programs may manage surveillance systems and support tools and services.

Public Health: The science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals.⁵

Public Health Quality: Quality in public health is the degree to which policies, programs, services, and research for the population increase desired health outcomes and conditions in which the population can be healthy⁶. This differs from health care quality.

Registry: A structured information collection system used to track and monitor the registered entity.

Sensitivity: The degree to which a surveillance system is able to detect a goal event, condition, etc.; this differs from specificity in that there may be a high level of false positives in an extremely sensitive system.

SFTP: Secure file transfer protocol is a [network protocol](#) that provides [file access](#), [file transfer](#), and [file management](#) functionalities over any reliable [data stream](#). (Source: Wikipedia)

Specificity: The degree to which a surveillance system is able to identify a given condition or event with a low level of false positive results.

SOAP-based web services: Simple object access protocol is a method for exchanging structured information in the implementation of [Web Services](#) in [computer networks](#). (Source: Wikipedia)

Surveillance System: An organized infrastructure that enables the ongoing, systematic collection, management, analysis, and interpretation of health-related data followed by their dissemination to those who require the information in order to: 1) monitor populations to detect unusual instances or patterns of disease, toxic exposure, or injury; 2) act to prevent or control these threats; 3) intervene to promote and improve health. The term applies to both electronic and paper-based systems.

Tool: An application that supports surveillance by enabling a very specific task (e.g., message transport, data transformation, communications, identity management). Tools differ from

4 Kindig D, Stoddart G. What Is Population Health? Am J Public Health 2003;93(3):380-383.

5 Winslow C-E A. The Untilled Fields of Public Health. Science 1920;51(1306):23-33.

6 Honore PA, Wright D, Berwick DM, Clancy CM, Lee P, Nowinski H, Koh HK. Creating a Framework for Getting Quality Into the Public Health System. Health Affairs 2011;30(4):737-745.

systems mainly in size, complexity, and the number of functions they support. A system can be comprised of multiple tools independently.

Timeliness: The ability of a surveillance system to detect an event, condition, or emergency of public health concern in real-time, or as close to real-time as possible.

Urgent Care setting: A health care setting that is often open longer hours than physician offices, does not require an appointment, and is ideally used for urgent, but non-emergency, illnesses and conditions.

VPN: Virtual private network is a technology for using the Internet or another intermediate network to connect computers to isolated remote computer networks that would otherwise be inaccessible.

**Except where otherwise noted, definitions are quoted or adapted from the Centers of Disease Control website at www.cdc.gov.*

Appendix 4: Data Element Term Definitions

Term	Definition
Data Element Name	Name of the minimum data set element.
Description of field	Description of the data element
Category	Refers to the category type that the data element belongs to: Core: R, RE, or Optional. Must be supported by the EHR system for EHR certification. Extended: Optional. Does not require support by the EHR system for EHR certification. Future: Data elements that need further discussion. Does not require support by the EHR system for EHR certification.
Usage	Refers to whether an element is a required or optional field. The Usage codes are: R – Required: Indicates that the field is a required field and must be supported by the EHR system. A real value, not “none” or any other incomplete value, must be present in the field in order for the message to be accepted and to avoid receiving an error message. NOTE: If a data element assigned as required is missing, the entire message will be returned to the data sender with an error. RE – Required, but can be Empty: Indicates that the EHR system must include the capability to provide this variable to public health, but clinical data may not be collected or available at the time of data transfer. If data are present, then they must be reported. However, if no data are or have yet been captured for the element in the clinical setting, the message may be sent with the field containing no data. NOTE: Many data elements are assigned the RE usage so that a message can still be accepted by the receiving system in instances where there are missing values. O – Optional: Indicates that this field must be supported by the EHR system, but clinical settings or PHA may opt not to send or receive it. Specific usage of these data elements shall be determined at the state or local-level jurisdiction.

Term	Definition
Cardinality	Minimum and maximum number of times the element may appear. [0..1] = Element may be omitted and it can have at most one occurrence [1..1] = Element must have exactly one occurrence [0..*] = Element may be omitted or repeat for an unlimited number of times
Rationale	The rationale for why the data element is included as part of the <i>Guidelines</i>
Value Set	Vocabulary or value set to be used for the data element
Notes	Additional notes that describes rules pertaining to the data element, how the data Element field should be processed, or identifies relevant values for the data element.

Appendix 5: Meaningful Use Workgroup Biographies

ISDS Meaningful Use Workgroup Members		
	Geraldine Johnson, MS (Chair)	Director, Public Health Informatics and Project Management Office <i>New York State Department of Health</i>
	Ms. Geraldine Johnson is the Director of the Public Health Informatics and Project Management Office for the New York State Department of Health. For over 24 years, Ms. Johnson has worked at local, regional, and state levels in public health. Her expertise includes infectious and non-infectious disease epidemiology, syndromic surveillance, public health informatics and program management. Her career achievements include managing a CDC grant to accelerate situational awareness through Health Information Exchanges in New York, and supporting the implementation of NYSDOH's statewide syndromic surveillance systems. She has previously served as Director of the Regional Epidemiology and Infection Control Programs for NYSDOH. Ms. Johnson was instrumental to developing the ISDS recommendations for syndromic surveillance using emergency department and urgent care centers that were published in January 2010	
	David Buckeridge, MD, PhD (Board Liaison)	Associate Professor of Epidemiology and Biostatistics <i>McGill University</i>
	Dr. David Buckeridge is Associate Professor of Epidemiology and Biostatistics at McGill University in Montreal where he holds a Canada Research Chair in Public Health Informatics and directs the Surveillance Lab. His research focuses on the informatics of public health surveillance. In addition to his academic duties, Dr. Buckeridge serves as a Medical Consultant to the Montreal Public Health Department, and the ISDS Board Chair and President. He has consulted on public health surveillance to groups such as the Institute of Medicine, the Centers for Disease Control, and the World Health Organization. Dr. Buckeridge was instrumental to developing the ISDS recommendations for syndromic surveillance using emergency department and urgent care centers that were published in January 2010.	
	Shandy Dearth, MPH	Epidemiologist Manager <i>Marion County Public Health Department</i>
	Ms. Shandy Dearth is an Epidemiologist Manager for the Marion County Public Health Department (Indianapolis, IN), where she is the lead infectious disease control epidemiologist, and supervises the Department's maternal and child health, environmental health, and preparedness epidemiologists. Ms. Dearth possess over 13 years of experience in local public health practice and epidemiology. In central Indiana, she has conceived and driven innovations that leverage the Indiana Health Information Exchange and collaborations with the Regenstrief Institute for public health purposes. Ms. Dearth established Marion County's syndromic surveillance protocols, and is currently leading efforts to use a syndromic surveillance approach for injury and chronic disease control and prevention. She also possesses experience in public health surveillance using inpatient and primary care data. In 2011, Ms. Dearth received an Innovations Award from the Marion County Health Department.	

	Jeffrey Ditty, MPH, PMP	Principle Consultant/Deputy Director of Consulting Services <i>Public Health Foundation Enterprises</i>
	Lyn Finelli, MS, DrPh	Lead Surveillance and Outbreak Response Team <i>Centers for Disease Control and Prevention</i>
	Richard Hopkins, MD, MSPH	Acting State Epidemiologist <i>Florida Department of Health</i>

Mr. Jeffrey Ditty is the Principal Consultant and Deputy Director of Consulting Services and Public Health Foundation Enterprises, and has 13 years of Electronic Health Record and specialized Health Information Technology experience supporting Public and Ambulatory Health organizations. He has been involved with and exposed to Health Information Exchange initiatives, methodologies, and architecture concepts. Jeffrey also has experience working with public and ambulatory health care organizations on initiatives to improve health outcomes through application of technology solutions. He has served on various county and state level public health and environmental health committees. Finally, Jeffrey is skilled in project management, business process, and requirements definition practices and methodologies.

Dr. Lyn Finelli is the Chief of Surveillance and Outbreak Response with the Influenza Division of the National Center for Immunization and Respiratory Diseases, CDC. In the Influenza Division, Dr. Finelli is responsible for leading a team of 35 scientists in conduct of influenza surveillance and special research studies. She led the epidemiology response for CDC during the H1N1 pandemic and has co-authored more than 150 scientific papers and book chapters and more than 100 published abstracts. She brings 20 years of public health and epidemiology experience. Prior to her position with the Influenza Division, Dr. Finelli was the Chief of the Surveillance Team of the Division of Viral Hepatitis, an epidemiologist in the Division of Sexually Transmitted Diseases, an epidemiologist and acting State Epidemiologist of the New Jersey Department of Health. Dr. Finelli is a member of the Infectious Disease Society of America.

Dr. Richard Hopkins is the Acting State Epidemiologist at the Florida Department of Health where he is overseeing the further development of Florida's groundbreaking Merlin surveillance information system, including the implementation of Electronic Laboratory Reporting and other electronic health data interchanges, and the award-winning ESSENCE-FL syndromic surveillance information system. Dr. Hopkins has 30 years of public health experience at the state, local and Federal level. He has worked for the Centers for Disease Control, the state public health agencies in Montana, Colorado, Ohio, West Virginia and Florida, and the Vinton County (OH) Health Department. He was State Epidemiologist in Colorado 1979-85 and in Florida 1991-2001. Dr. Hopkins worked for the Centers for Disease Control and Prevention, in the Division of Public Health Surveillance and Informatics, from 2003 to 2004. At a national level he has held numerous leadership positions, serving on the Executive Committee of the Council of State and Territorial Epidemiologists from 1982 to 1985 and from 1998 to 2001 (representing the chronic disease epidemiologists).

	Jeff Hummel, MD, MPH	Medical Director Washington-Idaho Regional Extension Center <i>Qualis Health</i>
	Dr. Jeff Hummel is the Medical Director at the Washington-Idaho Regional Extension Center for Qualis Health with over 30 years of practice experience. He has been an EpicCare user for over 13 years, and served as the Medical Director for Informatics and Quality Improvement for 5 of those years. Dr. Hummel also participated in an early syndromic surveillance pilot program with the Department of Public Health in King County. Since 2006 he has worked at Qualis Health, where he serves as the Medical Director for Healthcare Informatics and is the clinical lead for the Washington Idaho Regional Extension Center. In addition he helps lead the CMS funded ambulatory effort to improve primary and secondary prevention indicators for cardiovascular disease. From 2007 to 2009, Dr. Hummel was leader for the Washington State team for the National HISPC Collaborative on Standards for Privacy and Security in Health Information Exchange.	
	Larissa May, MD, MSPH	Assistant Professor of Emergency Medicine Associate Director of Clinical Research <i>George Washington University</i>
	Larissa May is Assistant Professor of Emergency Medicine and Associate Director of Clinical Research in the Department of Emergency Medicine of the George Washington University, Washington, D.C. She holds secondary appointments in the departments of Microbiology, Immunology and Tropical Medicine and Epidemiology and Biostatistics. Dr. May's principal areas of expertise are the use of the ED electronic health record for clinical and public health research and syndromic surveillance, bio-preparedness, public health microbiology, infection control, and clinical infectious disease epidemiology and management. She serves on the George Washington University Hospital Infection Control and Emergency Preparedness committees and chairs the Education and Training Committee of the International Society for Disease Surveillance.	
	Michelle Siefert, MT (ASCP)	Senior Strategist <i>Cerner Corporation</i>
	Ms. Michelle Siefert is a Senior Strategist, Public Health Surveillance at Cerner Corporation, where she has worked for the last 13 years. She helped lead the effort for certifying Cerner for the public health reporting objectives for Meaningful Use. In 2009, she managed a partnership between Cerner and the CDC to analyze signs and symptoms of influenza-like illnesses. Data was captured from over 600 Cerner facilities using a web service that scanned the EMR for data elements on a daily basis, and was then electronically submitted to the CDC. Michelle is currently working on developing a new syndromic report for Cerner's ambulatory clients using the final PHIN messaging guide for emergency department and urgent care.	

	Corey Spears	Enterprise Systems Architect <i>McKesson Corporation</i>
	Iona Thraen, PhD, ACSW	Director, Patient Safety <i>Utah Department of Health</i>
	Mr. Corey Spears is an Enterprise Systems Architect specializing in interoperability with McKesson Corporation (Seattle, WA). In his role at McKesson, Mr. Spears chairs the McKesson Interoperability Task Force, which identifies technology strategies for interoperability across and beyond McKesson. In addition, he currently serves as the Vice-Chair for the HIMSS EHRA Standards and Interoperability workgroup. For over 10 years, Corey has designed and developed clinical information system integrations and interfaces. He previously sat on the HIT Standards Panel (HITSP) and served as a co-chair of the HITSP Care Management and Health Records Domain Technical Committee (the committee that authored C32 which is part of Meaningful Use Stage 1 requirements). He is currently involved as a committed member of several ONC S&I Framework initiatives including the CDA Consolidation, Public Health Reporting, Transitions of Care, Data Segmentation for Privacy, and esMD. He has also been actively involved in HL7 for seven years, and has previously served as a co-chair of the HL7 EHR Workgroup.	
	Dr. Iona Thraen is the Patient Safety Director for the Utah Department of Health (UDOH) and brings over 10 years of experience with establishing, implementing, and maintaining the Patient Safety Program for the state of Utah. Employing a consensus based approach with peer review and quality work product protections, the program has grown from a 2001 manually faxed reporting system of 8 general sentinel events to a 2011 WEB based public health reporting portal. She is a trained social worker in group work and group processes and has used structured group judgment techniques including nominal group technique, Delphi and inter-rater agreement evaluation strategies. She serves on the NQF Patient Safety Measures and the Patient Safety Complications committees. She has spent the last 20 years in quality-related program implementation and evaluation activities. She will be receiving her doctorate degree in Biomedical Informatics in December 2011 from the University of Utah.	