

Syndromic Surveillance for Meaningful Use: Inpatient and Ambulatory Clinical Care EHR Data

Preliminary Analysis of Stakeholder Response to the
“Call for Potential Uses of Public Health Syndromic Surveillance”

Background

The International Society for Disease Surveillance (ISDS), in collaboration with the Centers for Disease Control and Prevention, is developing business and infrastructure requirements for syndromic surveillance using clinical data from health information exchanges. This project will result in new guidelines for public health syndromic surveillance (PHSS) using hospital inpatient and ambulatory clinical care electronic health record data that will shape the syndromic surveillance measure in future stages of the Meaningful Use (MUse) programs. Under this initiative, ISDS will also produce an assessment of health information interchange architecture for supporting PHSS business requirements.

ISDS has convened a MUse Workgroup comprised of subject matter experts in local, state and federal public health; clinical care; health information exchanges; and electronic health record (EHR) technology implementation. The Workgroup will rely on input and feedback from other MUse stakeholders, especially with regard to the feasibility, utility, validity, and completeness of the Workgroup recommendations. Input will formally be collected and analyzed, 1) At the beginning of the project; 2) Following a preliminary report on the guidelines; and 3) following a provisional report. The Workgroup will consider the input and comments received to ensure a final product that can effectively support public health authorities in using hospital inpatient and ambulatory clinical EHR data as part of MUse.

Methods

On 10/31/11, began gathering stakeholder perspectives on how inpatient and ambulatory clinical care EHR data might be used with a syndromic surveillance approach. ISDS sent a message to the entire ISDS electronic mailing list to request responses to the “Call for Potential Uses of Public Health Syndromic Surveillance.” The request was also disseminated by our partner organizations, the National Association of County and City Health Officials (NACCHO) and the Council of State and Territorial Epidemiologists (CSTE).

Stakeholders were asked the following:

1. What outcomes (i.e., health indicators or behaviors) can public health authorities routinely monitor with a syndromic surveillance approach and translate into public health action using hospital inpatient EHR data, or ambulatory clinical care EHR data?
2. What data elements (i.e., description and vocabulary) are required for syndromic surveillance using hospital inpatient EHR data, or ambulatory clinical care EHR data?
3. What evidence (i.e., anecdotal or documented) supports your required data elements for syndromic surveillance using hospital inpatient EHR data, or ambulatory clinical care EHR data?
4. What ambulatory clinical care settings collect health data that is of potential use to public health practice through syndromic surveillance?

Open-ended responses were collected using an on-line survey form. The survey remained open for approximately six weeks until Monday, 12/12/11.

Results

A total of 18 responses were received between 10/31/11 and 12/12/11. All responses were downloaded for review and analysis by the ISDS project team.

NOTE: *The views expressed here are the respondents’ and do not necessarily represent the views of the International Society for Disease Surveillance or the MUse Workgroup.*

“What outcomes (i.e., health indicators or behaviors) can public health authorities routinely monitor with a syndromic surveillance approach and translate into public health action using hospital inpatient, or ambulatory clinical care EHR data?”

Responses to this question were individually reviewed and assigned themes. All responses describe either a public health action (Theme = ‘Use’), or an outcome/indicator/measure that can be monitored or calculated with the data (Theme = ‘Outcome’). Responses also associated well with public health programs areas (e.g., chronic disease control and prevention, environmental and occupational health, etc.).

Below is a presentation of stakeholder comments collected. Responses are grouped by public health activities or program areas.

Public Health Activities or Program Areas	Response Count	
	Uses	Outcomes
1. Infectious disease control and prevention	11	11
2. Health Services Administration and Management	5	11
3. Environmental and occupation health and safety	4	13
4. Chronic disease control and prevention	4	7
5. Emergency preparedness and response	3	4
6. Injury and violence prevention and control	3	3
7. Vaccine safety and efficacy	3	2
8. Program or intervention evaluation	2	2
9. Reportable conditions	2	3
10. General assessment	1	2
11. Health disparities	1	1

1. Infectious disease control and prevention

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Gauge the severity of an influenza season	X	X
Support decision-making by epidemiologists, public health authorities, and for public information <u>during outbreaks</u>	X	X
Monitor conditions that are high volume and not reportable	X	X
Gauge the severity of an epidemic (e.g., influenza, GI-illness, shigella)	X	X
Healthcare associated infections	X	
Improve occupational health -Detection and characterization by employer -Detection and characterization by occupation -Occupational illness and injury	X	X
Guide preventive efforts including vaccination and social distancing policies	X	X
Corroborate (using other data streams/sources) and help identify spatiotemporal patterns of epidemics and target public health interventions and investigations	X	X
We would love to replace the manual ILINet system which has many inherent issues in recruiting and keeping providers who report in a timely and accurate fashion	X	X
Enhanced case finding during an outbreak of an event of public health interest/concern/safety or welfare	X	X
Enhanced surveillance/monitoring during an event of public health interest (e.g., watching for a return to baseline)	X	X

Outcomes or Indicators	I	A
Respiratory failure in persons with-obstructive pulmonary disease or with influenza/pneumonia	X	
Clusters of infectious disease occurring at a common geographic location/ address/ <u>workplace</u>		X
Hospitalizations related to certain infectious conditions (e.g. monitoring influenza-associated hospitalizations)	X	
Critical care related to certain infectious conditions (e.g. number of influenza hospitalizations requiring ICU care)	X	
Possible outbreak detection in inpatient settings (e.g. GI/Norovirus outbreak in extended care settings like nursing home and inpatient psych wards)	X	
Severity of seasonal and other epidemics (i.e., influenza - how many hospitalized vs. normal how many in the ICU).	X	

Outcomes or Indicators	I	A
ILI (due to influenza and other respiratory viruses) -- we would love to replace the manual ILINet system which has many inherent issues in recruiting and keeping providers who report in a timely and accurate fashion	X	X
Food borne illness (gastrointestinal syndromes)	X	
Indicators of localized gastrointestinal illness	X	X
Varicella-zoster virus		X
Tracking cases of certain infectious conditions (e.g. number of outpatient/ED visits for influenza or influenza-like-illness)		X

2. Health services administration and management

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Healthcare-associated infections	X	
Quality of care	X	
Cost to health infrastructure of repeat visits for a given condition		X
Effectiveness of prescribed treatments		X
Need for follow up visits or admission		X

Outcomes or Indicators	I	A
Surgical-site infections in persons with GSW & MVC	X	
Average hospitalization duration/length of stay for certain infectious conditions	X	
Antimicrobial usage in inpatient settings (e.g. number of inpatient Tamiflu orders or Tamiflu BMCA/eMAR data)	X	
Laboratory testing and results in hospital settings (e.g. number of influenza tests ordered among inpatients and number of positive influenza tests)	X	
Tracking procedures performed in certain infectious disease hospitalizations (e.g. mechanical ventilation in patients with influenza or blood transfusions in patients with Dengue)	X	
Inpatient Mortality	X	
Reason for visit (chief complaint)		X
Discharge diagnosis		X
Number of visits for same health condition/ problem		X
What procedures are being done in ambulatory care setting		X
Lab values at initial (and successive) visits		X

3. Environmental and occupation health and safety

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Detect events of public health significance	X	X
Improve environmental and occupational health	X	X
Monitor conditions that are high volume and not reportable due to lack of resources		X
Industry, occupation, and employer can be significant indicators of an event of public health significance. Similar to hospital data, a spike in ambulatory care encounters with patients working at the same facility or performing similar tasks, for example, could indicate an event or exposure of public health significance initiating at that site or suggest risk factors such as common exposures. Examples of this include exposure to anthrax in postal service workers or influenza and influenza-like illness (ILI) among accommodation and food service workers.	X	X

Outcomes or Indicators	I	A
Carbon monoxide exposure/carbon monoxide poisoning	X	
Chemical exposure/chemical poisoning	X	X
Lead exposure/lead poisoning	X	X
Patient admits by occupation, and place of employment	X	
Pesticide poisoning/pesticide exposures	X	X
Temporal or spatial clustering of asthma/COPD exacerbations	X	X
Work-related disease	X	X
Work-related injury	X	X
Amputations in persons with diabetes mellitus		X
Animal bites		X
Carbon monoxide exposure/carbon monoxide poisoning		X
Identification of age-specific morbidity or mortality through monitoring of age groups affected (for example pediatric vs general hospitals)		X
Temporal clustering of similar injuries occurring at common geographic locations		X

4. Chronic disease control and prevention

KEY: “I” = Using Inpatient EHR data; “A” = Using Ambulatory Clinical Care data

Public Health Activity or Use	Outcome/ indicator	I	A
Control and prevent chronic diseases		X	
Monitoring chronic disease risk factors	Prevalence: BMI, Smoking, [vital signs]		X
Surveillance for acute exacerbations of chronic diseases	Natural disasters, Extreme weather (heat, cold); Asthma; medication refills; rapid changes; inequalities	X	X
Impact of chronic diseases exacerbations on healthcare operations (during an incident)		X	

Outcomes or Indicators	I	A
Amputations in persons with diabetes mellitus	X	
Chronic illnesses (diabetes, heart disease)		X
Chronic respiratory illness (eg asthma)	X	
Episodes of stroke and other heart disease related conditions	X	X
Mental health		X
Obesity		X
Temporal or spatial clustering of Cardiovascular disease	X	X

5. Emergency preparedness and response

KEY: “I”=Using Inpatient EHR data; “A”=Using Ambulatory Clinical Care data

Public Health Use	I	A
Set data-driven triggers for activating public health preparedness measures (e.g., setting-up alternate care facilities or when/how to distribute necessary resources)	X	
Severe weather response	X	
Improve environmental and occupational health		X

Outcomes or Indicators	I	A
Monitor the demand on hospital resources	X	
Heat-related disease (including spatial, temporal indicators)	X	X
Event-related health outcomes (ability to link diverse outcomes to an event such as natural disasters, weather related events)	X	X
Poisonings (such as carbon monoxide)	X	

6. Injury and violence prevention and control

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Gain a complete look at medically attended injury in our state	X	
Impact of intentional & unintentional injury of healthcare operations	X	
Improve environmental and occupational health	X	

Outcomes or Indicators	I	A
Trends in inpatient admissions for injuries	X	X
Incidence of gun shot wounds and motor vehicle crashes	X	
Temporal clustering of similar injuries occurring at common geographic locations	X	

7. Vaccine safety and efficacy

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Vaccine safety monitoring		
Vaccine effectiveness monitoring		X

Outcomes or Indicators	I	A
Severe adverse vaccine events		
Influenza vaccination status in high-risk groups (pregnant women, persons with diabetes or COPD)		X

8. Program or intervention evaluation

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Assess the effectiveness of Streptococcus pneumoniae vaccination campaigns or statutory requirements (e.g., school admissions)	X	
Targeted interventions in certain age groups		X

Outcomes or Indicators	I	A
Admissions for invasive pneumococcal disease	X	
Identification of age-specific outbreaks through monitoring of age groups affected (for example pediatric vs general hospitals)		X

9. Reportable conditions

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Distinguish index cases from recurring cases	X	
Estimating the number of unreported, reportable cases	X	X

Outcomes or Indicators	I	A
Inpatient readmissions	X	
Other high-volume communicable diseases or conditions that are otherwise not reportable due to workload	X	
True burden of notifiable conditions (technically these are supposed to be reported, but we have a pretty good suspicion that many cases that seek healthcare are not reported)...this should be better with ELR		X

10. General assessment

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Assess the population and health infrastructure impact and burden of disease		X

Outcomes or Indicators	I	A
Incidence and prevalence of public health conditions of interest		X
Potential diagnoses based on laboratory orders and results, radiology orders and results and medication orders.		X

11. Health disparities

KEY: "I" = Using Inpatient EHR data; "A" = Using Ambulatory Clinical Care data

Public Health Use	I	A
Address health disparities	X	X

Outcomes or Indicators	I	A
Evaluation of the medically attended compared to the census of our state	X	X

“What data elements (i.e., description and vocabulary) are required for syndromic surveillance using hospital inpatient EHR data, or ambulatory clinical care EHR data?”

Responses to this question were individually reviewed, classified by source (i.e., inpatient clinical setting or ambulatory clinical care setting), and de-duplicated. Below is a preliminary presentation of stakeholder comments collected between 10/31/11 and 12/12/11.

Responses Are Grouped by Data Source

Hospital Inpatient

Page No.	Description	Element Count
9-11	Hospital inpatient data elements suggested for syndromic surveillance use	58

Ambulatory Clinical Care

Page No.	Description	Element Count
11-13	Ambulatory clinical care data elements suggested for syndromic surveillance use	73

“What data elements (i.e., description and vocabulary) are required for syndromic surveillance using hospital inpatient EHR data, or ambulatory clinical care EHR data?”

Hospital Inpatient Data Elements

ID	Data Element Description
1	Address / Home location (by zip code at least)
2	Admission and Discharge Dates or calculation of Length/Duration of Stay (in days)
3	Admission CPT or ICD-9 Procedure Codes
4	Admission Date/Time, Month/Year
5	Admitting Diagnosis, ICD-9
6	Age
7	Age units
8	Bedsection data (i.e. indicating type of ward(s) patients are hospitalized on...for example general surgery ward or Medical ICU) 3.
9	Chief complaint
10	County of residence
11	CPT or ICD-9 Procedure Codes
12	Diagnosis Rank
13	Diagnosis Related Group (DRG)*
14	Diagnosis Type (admitting, working, final)
15	Diagnosis / Cause of injury codes (including E codes and V codes) -- ICD9 /10; top 3 diagnoses; would be good to get BEFORE discharge!

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Inpatient and Ambulatory Clinical Care EHR Data*

16	Discharge Data indicated Death
17	Discharge Diagnosis - ICD-9
18	Discharge Disposition (at the very least released home, expired, transferring to another healthcare setting)
19	Discharge Disposition Date/Time
20	Disposition on the ward - ICU, general medicine, etc.
21	Medications
22	Employer and location: information about the specific employer and job location enhance the quality and accuracy of NAICS + SOCs data.
23	Ethnicity
24	Facility Identifier (NPI)
25	Facility Location
26	Facility/Visit Type (e.g. Inpatient)
27	Gender
28	History of Present illness -- exposure, temporal onset of symptoms, associations (food, water, setting, activity at time of onset/exposure)
29	ICU data (e.g. ventilator settings)*
30	ICU ever? (or alternatively hospital service area)
31	ICU status - markers of severity
32	Intubation - markers of severity
33	Laboratory test orders and results (eg microbiology cultures, rapid influenza diagnostic tests)
34	"Laboratory test results:
35	• Microorganism (virus, fungus, bacteria, ova, parasites) isolation, identification or detection by any means (including culture, immunofluorescence, Ag detection, EIA, DFA, cytology, histopathology, PCR, microscopy, immunohistochemistry, blood smear, immunoblot)
36	• Immunology/Serology (e.g. Ab titers)
37	• Virology (viral load)
38	• Blood lead level
39	• Serum alanine Transaminase (ALT)
42	Medical Record Number
43	Birth Month and Year
44	Mortality records
45	NAICS: The North American Industry Classification System (NAICS) is used to classify business establishments and contributes to an accurate picture of a worker's employment situation, in conjunction with occupational information.
46	Occupation/Industry (usual occupation, usual or longest employer, current employer)
47	Patient Demographics
48	Pharmacy Orders and/or Inpatient Bar Coded Medication Administration (BCMA) or eMAR data
49	Pregnancy Status
50	Procedure Codes; Procedures/Surgeries during stay
51	Race
52	Radiology test orders and results (eg chest xrays)
53	Report Date/Time
54	Rx that is readily available and applicable
55	Same elements as captured for ED and UC. Does not matter whether the info

	comes out of a basic hospital information system versus an EHR system; The minimum core data set [ED & UC] is fine but we will be adding procedure codes to augment other programs who would make their surveillance decision on those fields.
56	Smoking status
57	SOC: The Standard Occupational Classification system is used to classify jobs and contributes to an accurate picture of a worker's employment situation, providing additional detail that further clarifies risk.
58	State of residence (2 letter)

“What data elements (i.e., description and vocabulary) are required for syndromic surveillance using hospital inpatient EHR data, or ambulatory clinical care EHR data?”

Ambulatory Clinical Care Data Elements

ID	Data Element Description
65	Address
66	Age
67	Age units
68	Arrival Time monitoring (for ED and urgent care settings)*
69	Birth Month and Year
70	Blood pressure
71	Campylobacter isolates cluster alert might trigger the HD to collect case report details or conduct PFGE testing, which may be non-routine activities for ampylobacteriosis.
72	Chief Complaint
73	Chief Complaint or ICD9/10 or physician written diagnosis of encounter - preferably all, especially if one is acquired earlier than the others
74	Co-morbid conditions: Elements related co-morbid conditions which might not be picked up in inpatient data but which should be part of the ambulatory record.
75	County of Residence
76	Denominators for total number of outpatient/ED visit
77	Detecting event-related outbreaks by comparing facility catchment area with the patient's home zip code.*
78	Diagnosis Rank
79	Diagnosis Type (admitting, working, final)
80	Diagnosis / Cause of injury codes (including E and V codes) -- ICD9 (or ICD10)
81	Discharge Diagnosis
82	Discharge Disposition (e.g., released home, transferred to another healthcare setting, no follow up, orders for return visit, sent to hospital)
83	Disposition Data
84	Employer and location: information about the specific employer and job location enhance the quality and accuracy of NAICS + SOCs data.
85	Ethnicity
86	Fever status (measured or reported)
87	Gender

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Inpatient and Ambulatory Clinical Care EHR Data*

88	HDs could strengthen cooperative partnerships with healthcare systems, such that in addition to routinely submitting their isolates to the HD for possible further testing, laboratories in these healthcare systems could provide HDs with counts of microbiology tests ordered and positive, by zip code, for automated daily analyses at the HD, in order to identify unusual space-time clustering.
89	Height
90	History of present illness -- exposure, temporal onset of symptoms, associations (food, water, setting, activity at time of onset/exposure)
91	Repeat Visit for same problem?
92	Distinguish between routine visits and emergency clinic visits. It depends on what the goal is: are we going to get into the business of tracking annual check-ups and well-baby visits or do we want to focus on ongoing health events like we currently do with syndromic surveillance, like tracking flu and GI bugs.
93	Medication Dispensings of Influenza antiviral
94	Laboratory results: • Microorganism (virus, fungus, bacteria, ova, parasites) isolation, identification or detection by any means (including culture, immunofluorescence, Ag detection, EIA, DFA, cytology, histopathology, PCR, microscopy, immunohistochemistry, blood smear, immunoblot) • Immunology/Serology (e.g. Ab titers) • Virology (viral load) • Blood lead level • Serum alanine Transaminase (ALT) • Fasting glucose • HbA1C Exclude STDs and HIV? CD4 + T4 lymphocyte? Toxicology (e.g. blood alcohol, pesticide/poisoning)? Cancer markers?
95	Laboratory test orders/results
96	Linkage: Best if all can be linked - eg, rapid flu test, vaccination status and ICD9 for flu diagnosis in the same patient
97	Location
98	Medical Record Number
99	Medications prescribed during visit
100	Medications, immunizations, immunoglobulins, & immunotherapy
101	Microbiology test results
102	NAICS: The North American Industry Classification System (NAICS) is used to classify business establishments and contributes to an accurate picture of a worker's employment situation, in conjunction with occupational information.
103	Occupation/Industry (usual occupation, usual or longest employer, current employer)
104	Patient demographics
105	Patient Identifier (encrypted or truncated as provided in the previous question) that would not only track patients across different hospitals (such as for inpatient readmissions) but also across different systems of care (ambulatory outpatient, ER, obs, inpatient, SNF, etc).
106	Pharmacy orders/fills
107	Practice Type (e.g. family, pediatric, urgent, specialty)
108	Pregnancy status
109	Prescriptions; Prescriptions that are readily available and applicable
110	Procedures (e.g., vaccinations administered) during visit; ICD-9 codes
111	Provider/Clinic Identifier (NPI)
112	Provider/Clinic Location

*Syndromic Surveillance for Meaningful Use:
Inpatient and Ambulatory Clinical Care EHR Data*

113	Race
114	Radiology test orders/results
115	Reason for visit
116	Report Date/Time
117	RT-PCR influenza tests ordered
118	RT-PCR tests positive for influenza type A
119	Salmonella isolates may be prioritized for investigation (e.g., patient interview and/or PFGE testing) based on the presence of an unusual serotype, an increase in a common serotype, or recognized clusters.
120	Same data elements as captured for ED data; The minimum core data set [Ed & UC] is fine but we will be adding procedure codes to augment other programs who would make thier surveillance decision on those fields.
121	Smoking status
122	SOC: The Standard Occupational Classification system is used to classify jobs and contributes to an accurate picture of a worker's employment situation, providing additional detail that further clarifies risk.
123	State of residence (2 letter)
124	Stool culture tests ordered
125	Stool culture tests positive for specific pathogens, such as Salmonella, E. coli O157:H7, Shigella, and Campylobacter
126	Symptoms
127	Telephone care data*
128	Travel history if obtained in the EHR
129	Vaccination history
130	Vaccination status (especially influenza) -- could be self-reported
131	Visit Date/Time
132	Visit ID
133	Visit Month and Year
134	Visit type (e.g., preventative care, illness/injury)
135	Vital signs (temp especially)
136	Weight
137	Zip code of residence (5 digit)

“What ambulatory clinical care settings collect health data that is of potential use to public health practice through syndromic surveillance?”

Responses to this question were individually reviewed and de-duplicated. Below is a presentation of stakeholder comments collected between 10/31/11 and 12/12/11.

Description of Ambulatory Care Setting
Acute care clinics
All types of practitioners
Cardiac specialty clinics
Chiropractic office visits
Community health centers
Dentists; Dental Office Visits; Could track changes in tooth decay
Emergency departments; ER
Federally-qualified health centers
Group practice ambulatory clinics
Home-based primary care providers
Less interested in data from dentists, podiatrists, optometrists, chiropractors, etc. (King County, Seattle, WA)
Lesser significance: For purposes of prevention (as opposed to health care quality), Ambulatory surgery/elective procedure settings are probably of lesser significance than, for example, physician offices.
Managed care organizations
Medical office visits (all types of practice/specialty); MD
Midwives
Migrant health clinics
Naturopathic Medicine; ND
Nurse Practitioner; NP
Optometrists
Osteopathic Medicine; DO
Physicians assistant; PA
Physicians
Family practice or pediatrics practices
Podiatry visits
Primary care; primary care ambulatory clinics
Pulmonary care clinics
Rural health centers/clinics
Specialist physician offices/practices (DO or MD)
Sub-specialty ambulatory care clinics (to a lesser extent)
Telephone care
Urgent care clinics