

Creating a Vocabulary from Consensus Syndrome Definitions

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Objective

Develop an ontology for defining and
describing clinical conditions appearing in
triage chief complaints

- based on current practice
- has input from a broad base of developers and users of syndromic surveillance systems
- can be easily implemented in an automated surveillance system

Scope of Ontology

To assist public health in monitoring, characterizing, detecting, and responding to changes in population health based on patients' initial clinical presentation of acute outbreaks and exposures

Overview

1. Initial meeting to form consensus definitions
2. Subsequent work on refining definitions
3. Description of ontology

1. ISDS-funded Meeting

Develop consensus syndrome categories and definitions, using the catalogue of existing definitions as a starting point

Characterize Currently Used Syndromic Definitions

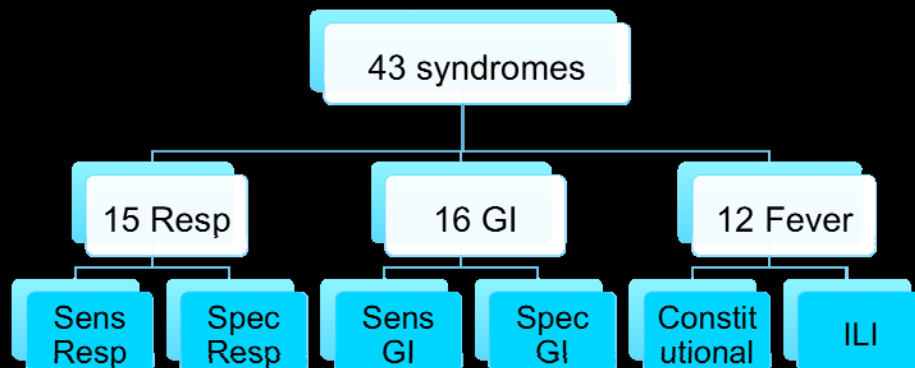
10 syndromic surveillance systems

1. RODS
2. BioPortal (Univ of Arizona)
 - Seattle, King County
 - Biosense
 - NCDetect
 - Aegis (Harvard)
 - Essence
 - New York State
 - Boston Public Health Dept
 - New York City

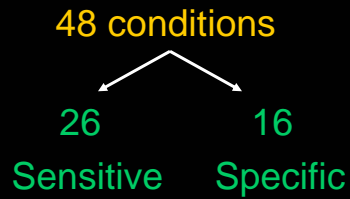
Participants

- David Buckeridge
- Craig Hales
- Carol Sniegowski
- Karen Olson
- Jeremy Espino
- Cathy Larson
- Mikaela Keller
- Lori Hutwagner
- David Thompson
- Dennis Cochrane
- Marc Paladini
- Julia Gunn
- Atar Baer
- Bill Lober
- Matt Scholer
- John Dowling
- Rebecca Noe
- Peter Elkin
- Wendy Chapman

Initial Consensus Syndromes



Respiratory Syndrome



Clinical Condition	Sens	Spec
BREATHING DIFFICULTY	1	1
COUGH	1	1
HEMOPTYSIS	1	1
ASTHMA ATTACK	1	1
CROUP	1	1
PNEUMONIA	1	1
WHEEZING	1	1
RUNNY OR STUFFY NOSE	1	0
PLEURITIC PAIN	1	0
SORE THROAT	1	0
URI	1	0
...		

GI Syndrome



Clinical Condition	Sens	Spec
ABDOMINAL PAIN	1	0
DIARRHEA	1	1
VOMITING	1	1
NAUSEA	1	0
GASTROENTERITIS	1	1
DEHYDRATION	1	0

Constitutional Syndrome

32 conditions



12

- IRRITABLE BABY
- FEVER
- WEAKNESS
- ANOREXIA
- VIRAL SYNDROME
- FAINTNESS
- MALAISE
- BODY ACHES
- GENERAL ILLNESS
- CHILLS
- LYMPHADENOPATHY
- SWEATING

Influenza-like Illness Syndrome

17 conditions



12

- COUGH
- SORE THROAT
- FEVER
- WEAKNESS
- VIRAL SYNDROME
- BODY ACHES
- BRONCHIOLITIS
- PNEUMONIA
- UPPER RESPIRATORY INFECTION
- MALAISE
- CHILLS
- INFLUENZA

2. Refining the Definitions

Monthly phone calls

GI Syndrome

ABDOMINAL PAIN

DIARRHEA

VOMITING

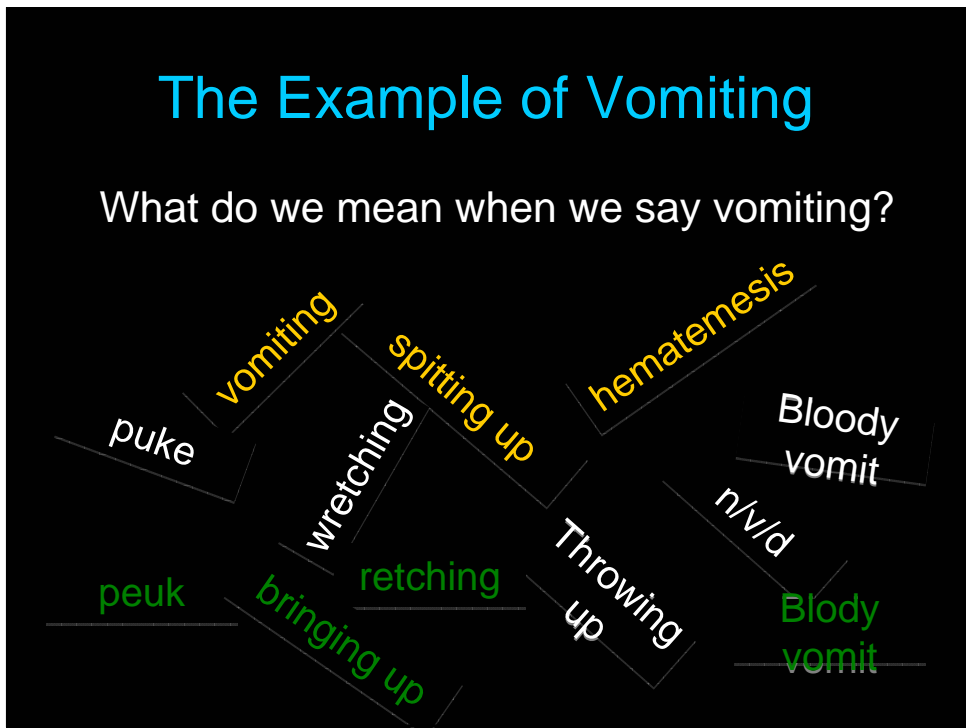
NAUSEA

GASTROENTERITIS

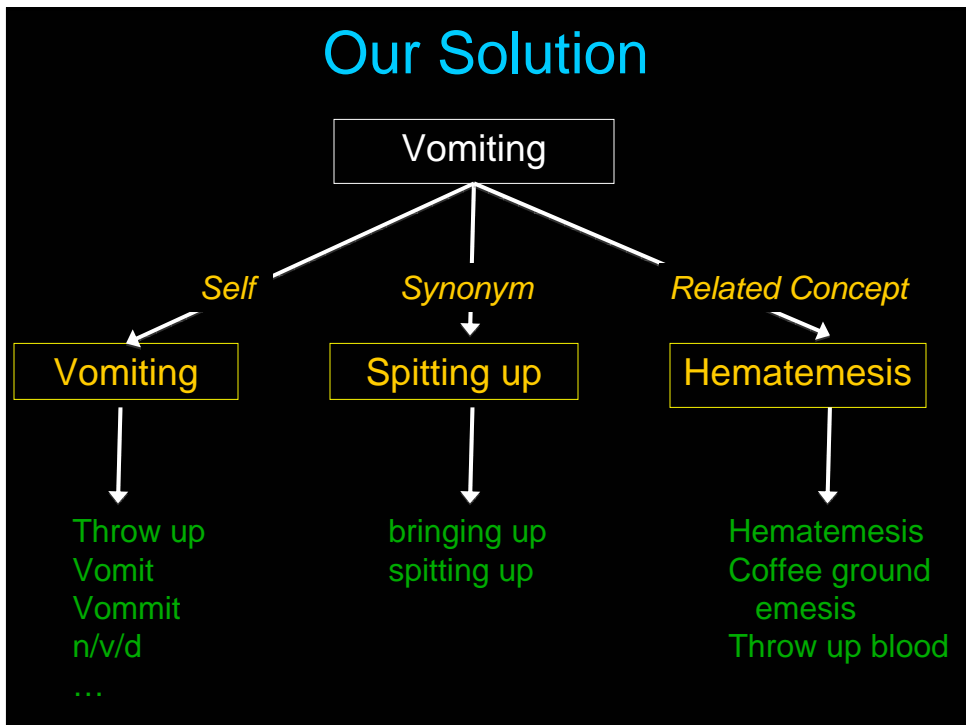
DEHYDRATION

The Example of Vomiting

What do we mean when we say vomiting?



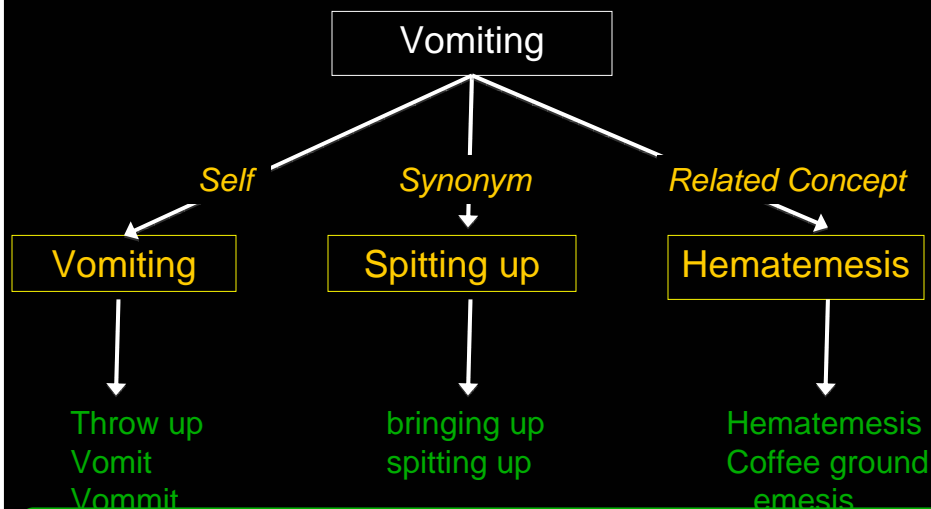
Our Solution



The definitions are not meant to be the best definitions

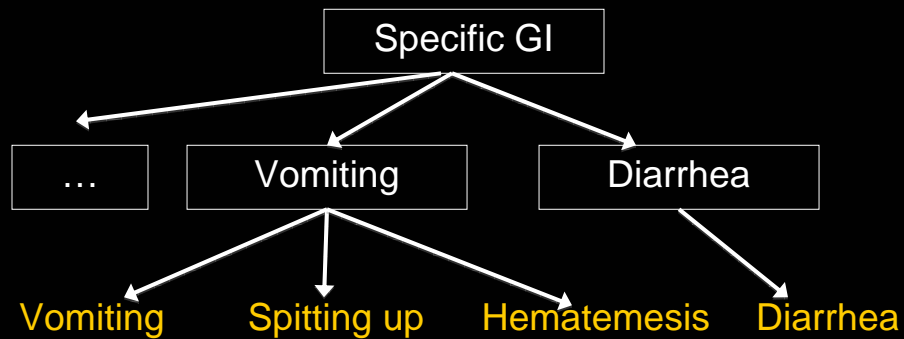
Provide a starting point

What do you mean by vomiting?



Explicit representation mapped to vocabularies

What do you mean by GI Syndrome?



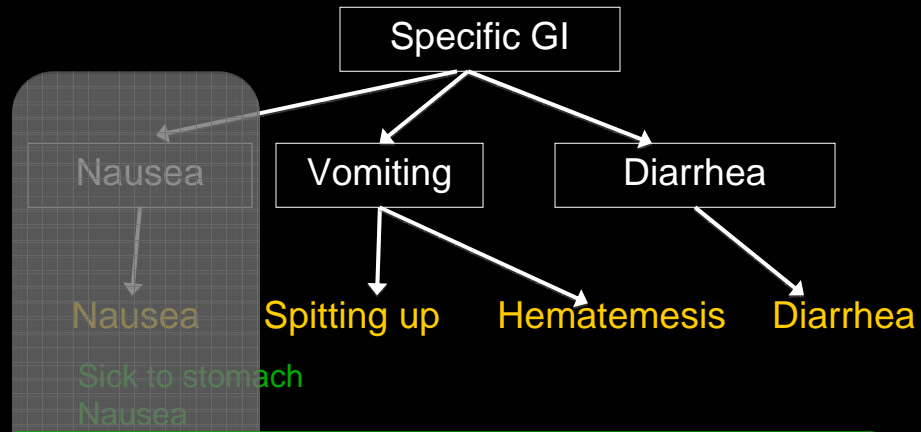
A starting point for conversation and collaboration

Does a chief complaint of nausea really predict GI syndrome of interest to public health?

- North Carolina: 11% PPV
- Utah: 4% PPV
- New York: 28% PPV

A starting point for validation

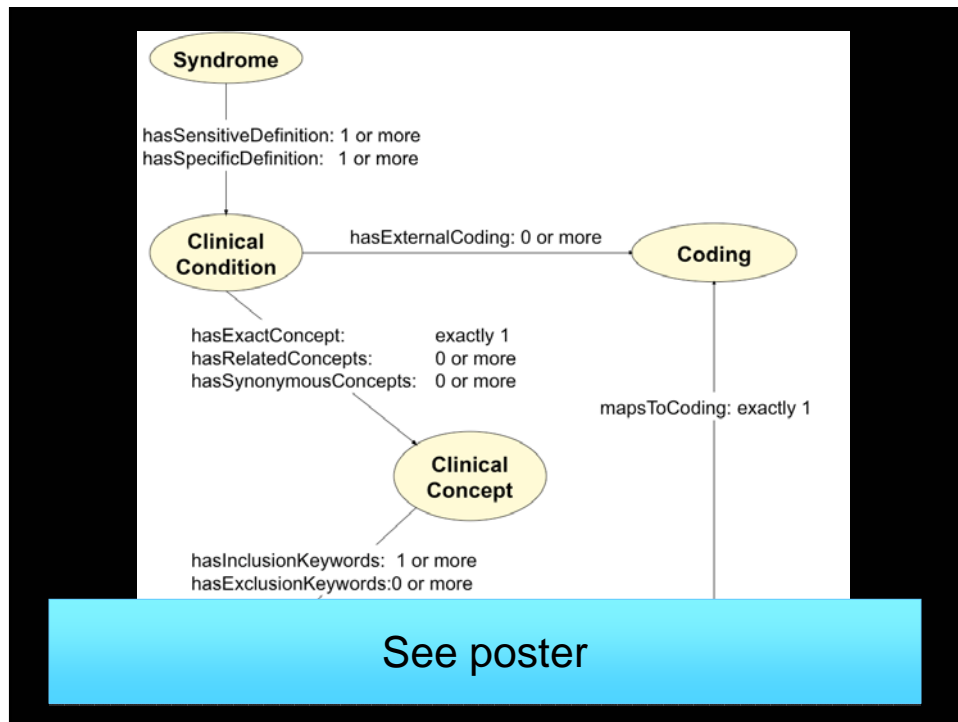
I don't want to include nausea in my surveillance definition of GI



Flexible and easy to modify

3. Creating an OWL Ontology

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Anya Okhmatovskaia
Michael Conway
Jeremy Espino
Nigel Collier



Functional Uses of Ontology

- Generate a document with description of the syndrome definitions
- <http://surveillance.mcgill.ca/projects/sso/SyndromeDef.html>

Syndromic Surveillance Ontology

http://surveillance.mcgill.ca/projects/sso/SyndromeDef.html#syndrome3

Syndromic Surveillance Ontology

[\[Respiratory Syndrome\]](#)
[\[Influenza-like Illness Syndrome\]](#)
[\[Constitutional Syndrome\]](#)
[\[Gastrointestinal Syndrome\]](#)

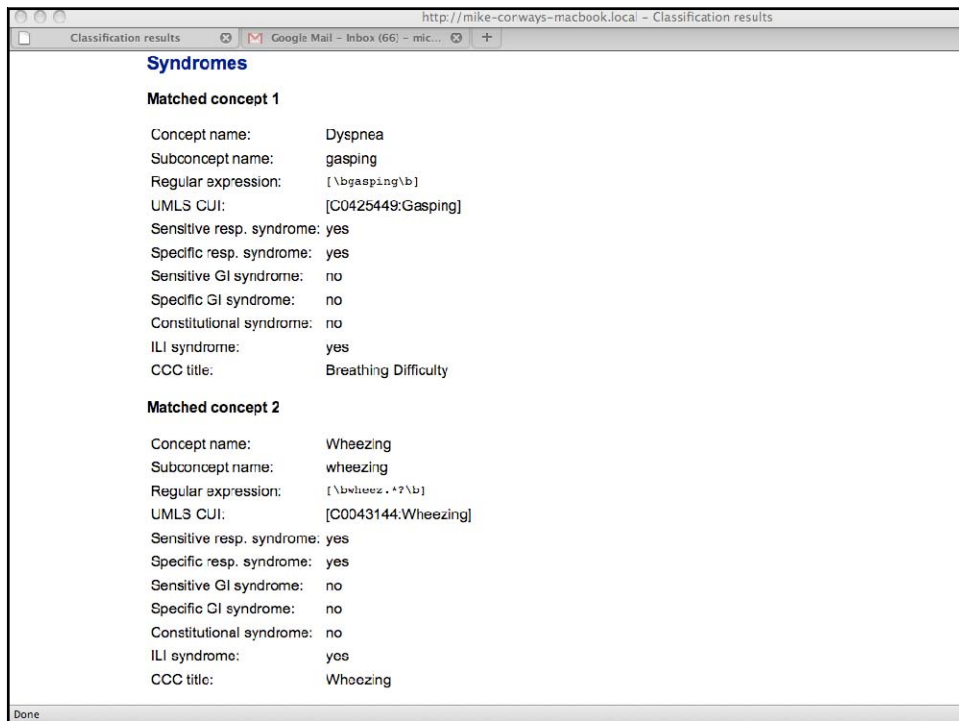
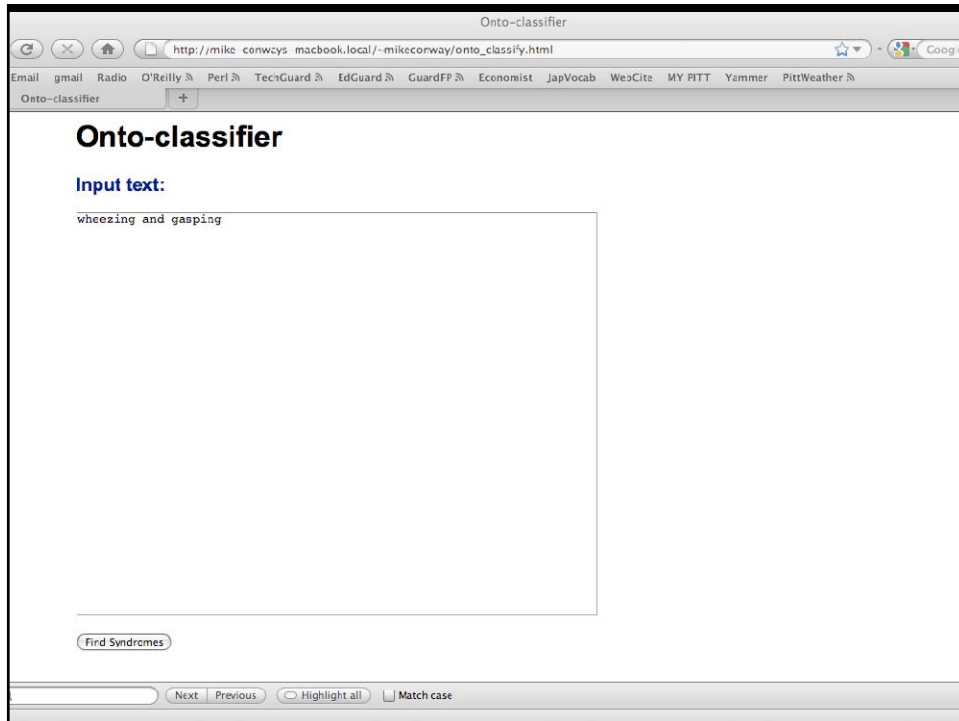
Respiratory Syndrome

Sensitive definition: 24 conditions
Specific definition: 15 conditions

Clinical Condition	Sensitive	Specific
+ Pleural effusion	✓	✓
+ Pneumonia	✓	✓
+ Hypoxia	✓	✓
+ COPD	✓	✓
+ Sore throat	✓	–
+ Apnea	✓	–
+ Hoarseness	✓	–
+ Upper respiratory infection	✓	–
+ Hemoptysis	✓	✓
+ Chest congestion	✓	✓
+ Bronchitis	✓	✓
+ Tachypnea	✓	✓
+ Sinusitis	✓	–
+ Pleuritic pain	✓	–
+ Lower respiratory infection	✓	✓
+ Dyspnea	✓	✓
+ Earache	✓	–
+ Influenza	✓	✓

Functional Uses of Ontology

- Perform chief complaint classification



Limitations

- Only addresses concepts that are seen in chief complaints
- Not validated in any way

Future Community Directions for Chief Complaint Ontology

- Perform validation experiments and modify the ontology
- Deploy chief complaint classification quickly and easily
- Share data across jurisdictions using explicit definitions
- Annotate set of chief complaints for chief complaint classifier comparison
- Expand to other syndromes

Future Directions

- Expand ontology beyond chief complaints
 - Chest radiography reports
 - Emergency department
- Develop natural language processing applications that use the ontology
 - More sensitive and specific case detection

What other ideas do you have?

Thank you

- Ontology available at
 - www.dbmi.pitt.edu/blulab/resources/syndrome-definitions.xls
 - <http://bioportal.bioontology.org/ontologies/40646>
- Will post pointers on ISDS website