Leveraging HIT for Public Health Surveillance

Presented by:
Edward Barthell, MD, MS

HIT Summit
October 22, 2004

Edward Barthell, MD, MS

Infinity Healthcare – Emergency physician staffing

American College of Emergency Physicians
- Frontlines of Medicine workgroup

EMSystem - ASP for diversion, mass casualty mgt, ED data collection and communication

National Institute of Medical Informatics
- Wisconsin Health Info Exchange

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Agenda:

Establishing a vision

Sharing data

Syndromic surveillance

Lessons

Future plans

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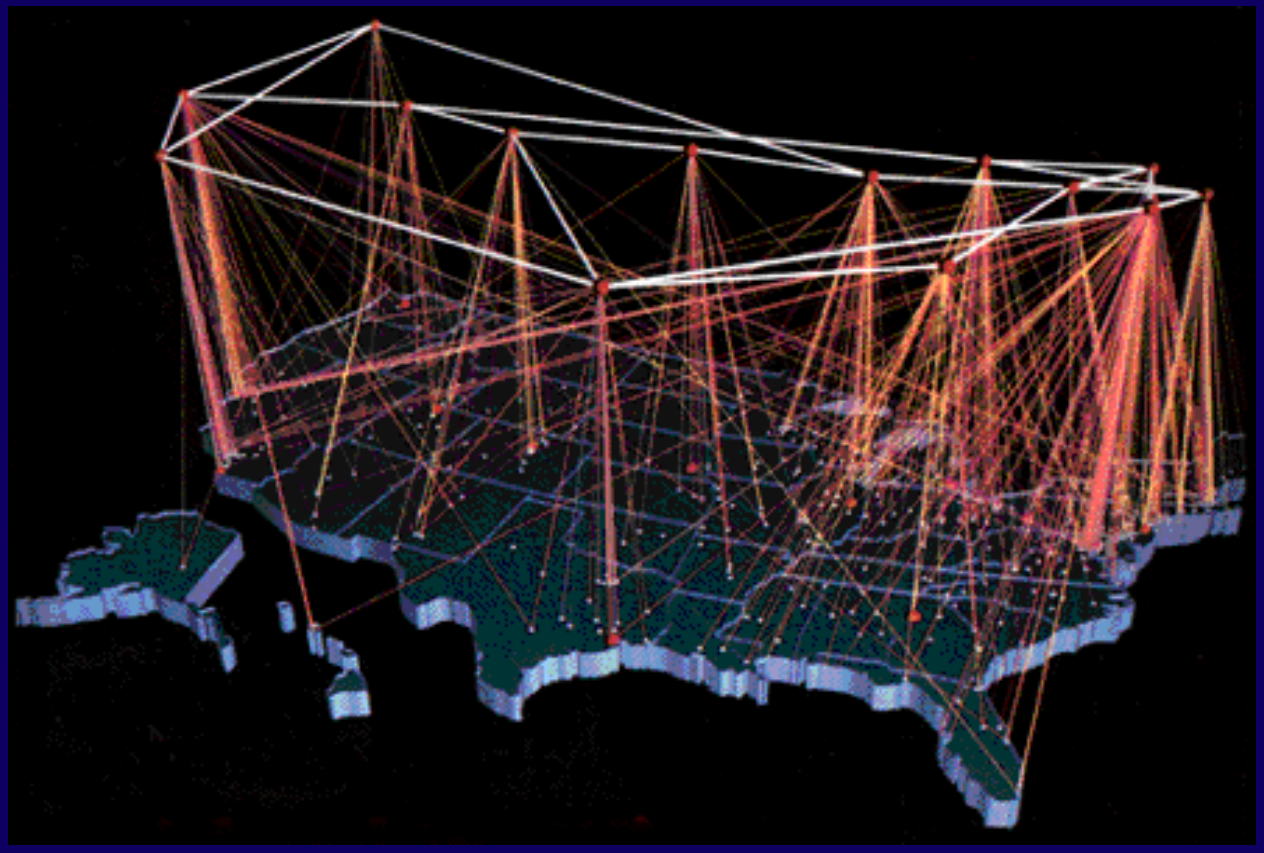
A public-private partnership dedicated to driving improvement in the quality, safety, and cost-effectiveness of health care through information technology

eHI Vision :

An interconnected, electronic health information infrastructure that benefits all stakeholders in the health care system …



eHI Vision

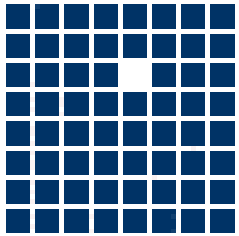
- Computerized patient records in every clinician's office.
- Interoperable health care systems with secure connectivity across providers, patients, payers, public health and others.

eHI Vision

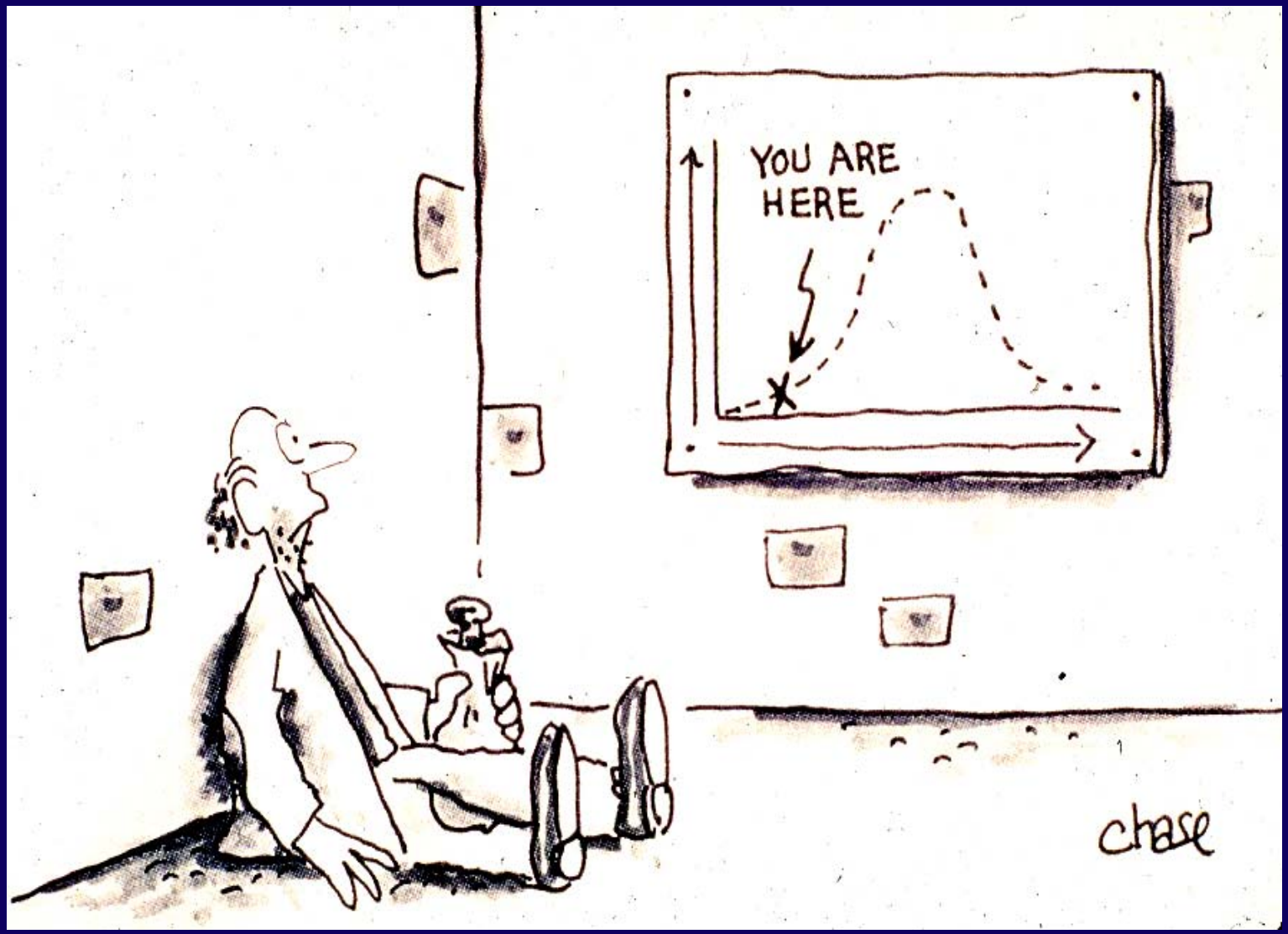
- Clinicians armed with the information they need to make the best clinical decisions at the right time.
- Consumers, patients and caregivers armed with the information they need to manage and address their own health care needs.

EM Physicians and Computers

- ACEP Informatics Section
- Annual ACEP Informatics Meeting



American College of Emergency Physicians®



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Emergency Department of the Future

The Emergency Department of the Future

ACEP President Larry Bedard, MD, cuts the ribbon to officially open the Emergency Department of the Future as representatives of ACEP and the National Information Infrastructure-Health Information Infrastructure (NII-HIN) look on. ACEP joined with NII-HIN to launch this project, which demonstrates the potential impact of information technology on emergency medicine in the near future. The exhibit is located in booths 1346, 1348 and 1350 in the exhibit hall.

ACEP Scientific Assembly

New Orleans September 1996

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EDOF Project

- Provide a strategic vision & enthusiasm among emergency physicians & the medical industry.
- Present a show case for medical products & computerized technologies.
- Provide optimism about the future of medicine.
- A place for education & learning.

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DEEDS

Authorized reuse of DEEDS based ED data can potentially help….

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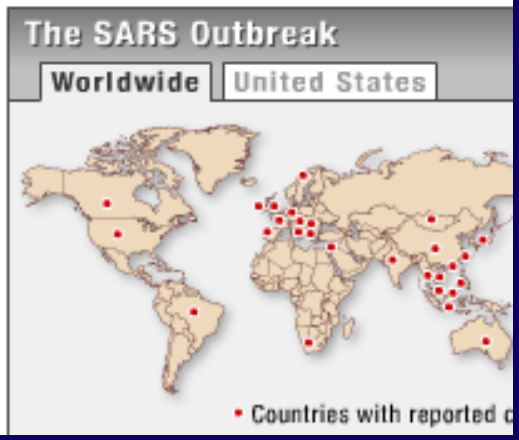
Surveillance and Preparedness

SARS Causes 'Mass Panic' in Beijing, Official Says

By John Pomfret
Washington Post Foreign Service
Thursday, May 1, 2003; 1:33 PM

BEIJING, April 30 -- The SARS epidemic in Beijing is causing "mass panic" and is being worsened by a lack of hospital beds and trained health professionals, the new acting



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Rand Science and Technology Institute –

Infrastructure for successful preparedness must address:

- Objectives
- Capabilities
- Stakeholders
- Data Needs

RAND®

A nonprofit institution that helps improve policy and decisionmaking through research and analysis

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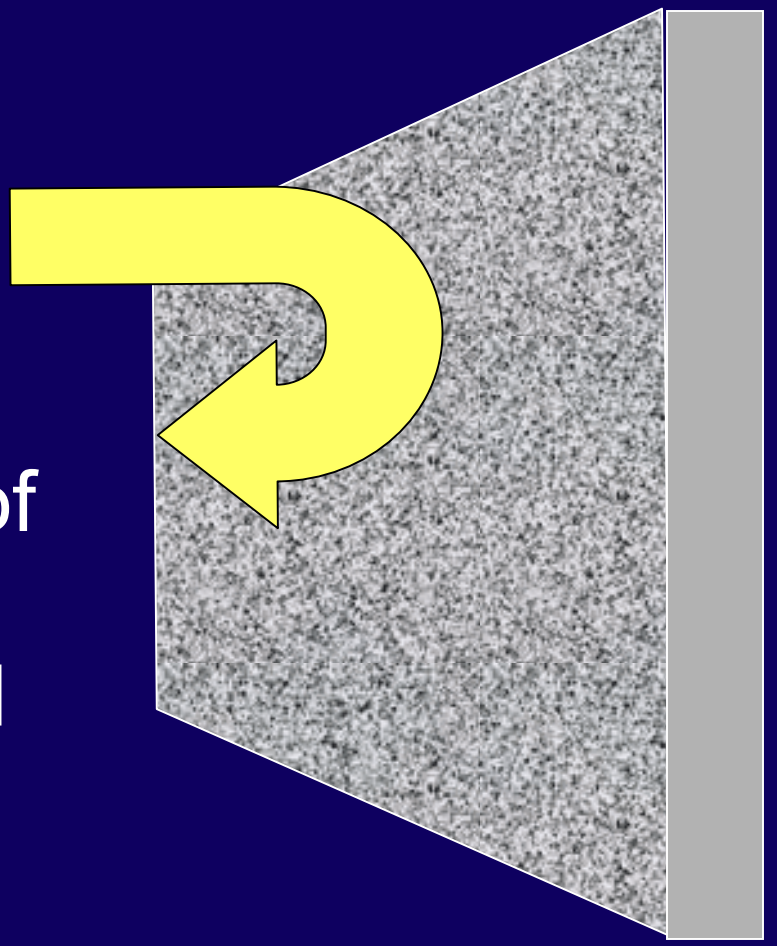
History - Barriers

- Inadequate systems for sharing information between clinical providers
- Inadequate sharing of information between clinical providers and other stakeholders



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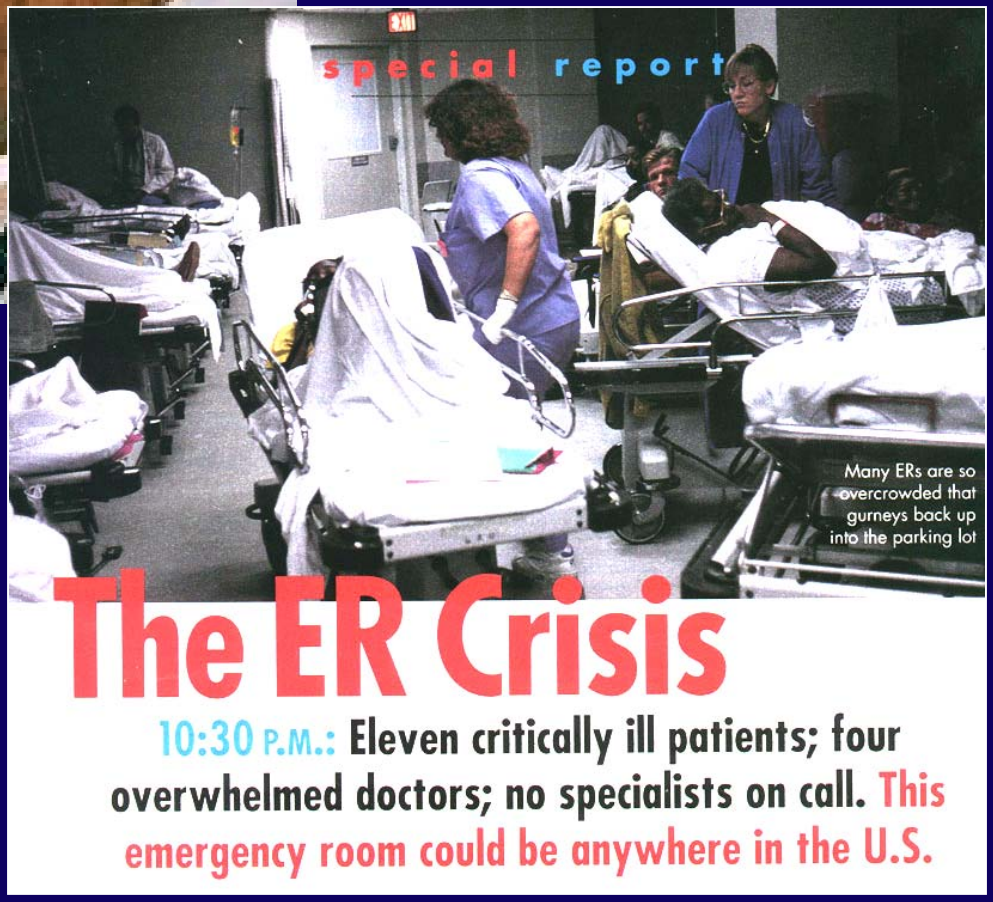
Emergency Medicine

Normal operational mode = survival as priority



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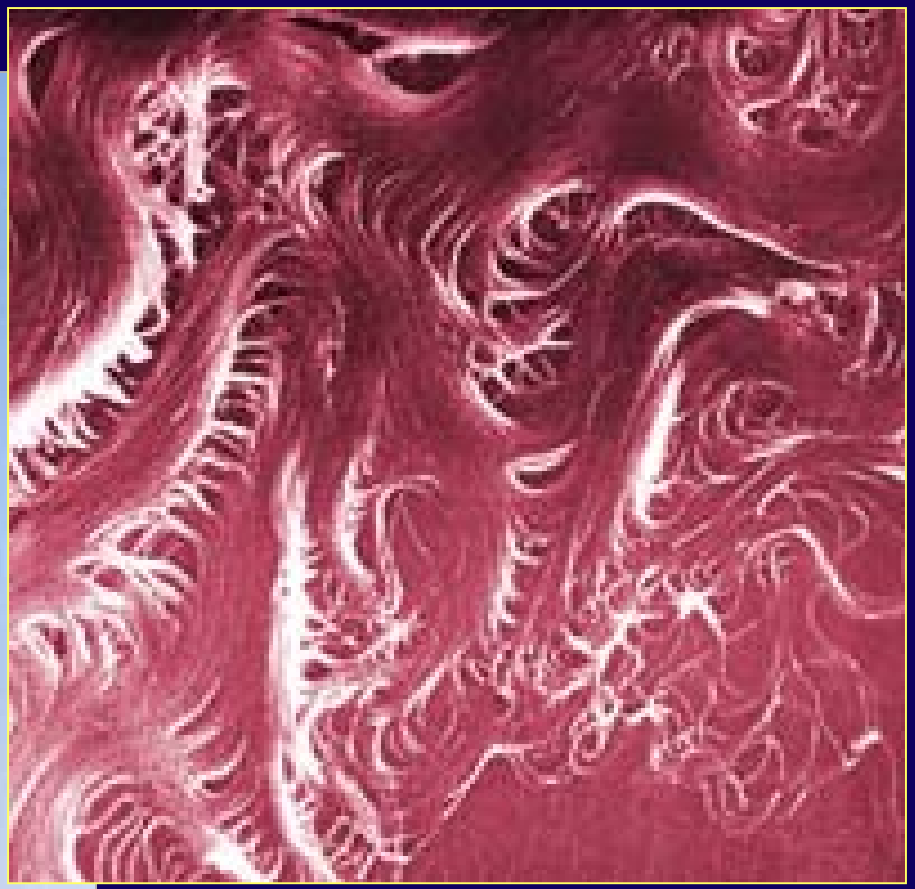
New motivation….



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Public Health Goal

Indianapolis Network for Patient Care (INPC):

Link clinical activities and public health activities to improve the population's health

Frontlines of Medicine

- Develop a standardized approach for submission of emergency encounter data to regional centers to allow for *rapid deployment* of widespread syndromic surveillance

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Frontlines Recommendations

- Focus on real time data collection and analysis

- Best initial mechanism is systematic passive collection as a by-product of routine care of individual patients

Methods

- Published initial paper with proposed approach and standards
- Identified experts / stakeholders
- Invited feedback, established partners
- Consensus conference April 2002

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Annals of Emergency Medicine, April 2002

The Frontlines of Medicine Project: A Proposal for the Standardized Communication of Emergency Department Data for Public Health Uses Including Syndromic Surveillance for Biological and Chemical Terrorism

Edward N. Barthell, MD*§§
William H. Cordell, MD‡
John C. Moorhead, MD, MS§
Jonathan Handler, MD||
Craig Feied, MD¶
Mark S. Smith, MD¶
Dennis G. Cochrane, MD#
Christopher W. Felton, MD**
Michael A. Collins, BS‡‡

The Frontlines of Medicine Project is a collaborative effort of emergency medicine (including emergency medical services and clinical toxicology), public health, emergency government, law enforcement, and informatics. This collaboration proposes to develop a nonproprietary, "open systems" approach for reporting emergency department patient data. The common element is a standard approach to sending messages from individual EDs to regional oversight entities that could then analyze the data received. ED encounter data could be used for various public

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Methods

- Delphi survey process via email
- Initial validation of results
  - Triage surveillance report data elements
  - Chief complaint values
- Publish resulting recommendations
- Encourage pilot testing, evaluation
- Encourage widespread deployment

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Frontlines Recommendations

- Flexibility is needed

- Focus on standardizing the message, not standardizing the data capture mechanism

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Annals of Emergency Medicine, September 2004

The Frontlines of Medicine Project Progress Report: Standardized Communication of Emergency Department Triage Data for Syndromic Surveillance

Edward N. Barthell, MD, MS
Dominik Aronsky, MD, PhD
Dennis G. Cochrane, MD
Greg Cable, PhD
Thomas Stair, MD
For the Frontlines Work Group*

From the Department of Emergency Medicine, St. Mary's Hospital Ozaukee, Mequon, WI (Barthell); the Department of Emergency Medicine, Medical College of Wisconsin, Milwaukee, WI (Barthell); the Department of Biomedical Informatics, Vanderbilt University Medical Center, Nashville, TN (Aron-

This article reports progress since the original publication of the Frontlines of Medicine Project. This project is a collaborative effort of emergency medicine (including emergency medical services and clinical toxicology), public health, other government agencies involved in health care and preparedness, law enforcement, and informatics to develop nonproprietary, standardized methods for reporting emergency department patient data. These data may be used for a variety of public health or clinical care initiatives, including syndromic surveillance for chemical and biological terrorism. This article reviews the outcome of the Project meeting in April 2002. Also, the article describes a Delphi Survey process to define the data elements in a triage surveillance report and to define a set of codified values for the chief complaint data element. An initial retrospective validation of the codified chief complaint values is provided, and prospective study of the proposed Frontlines' standards is encouraged.

[*Ann Emerg Med.* 2004;44:247-252.]

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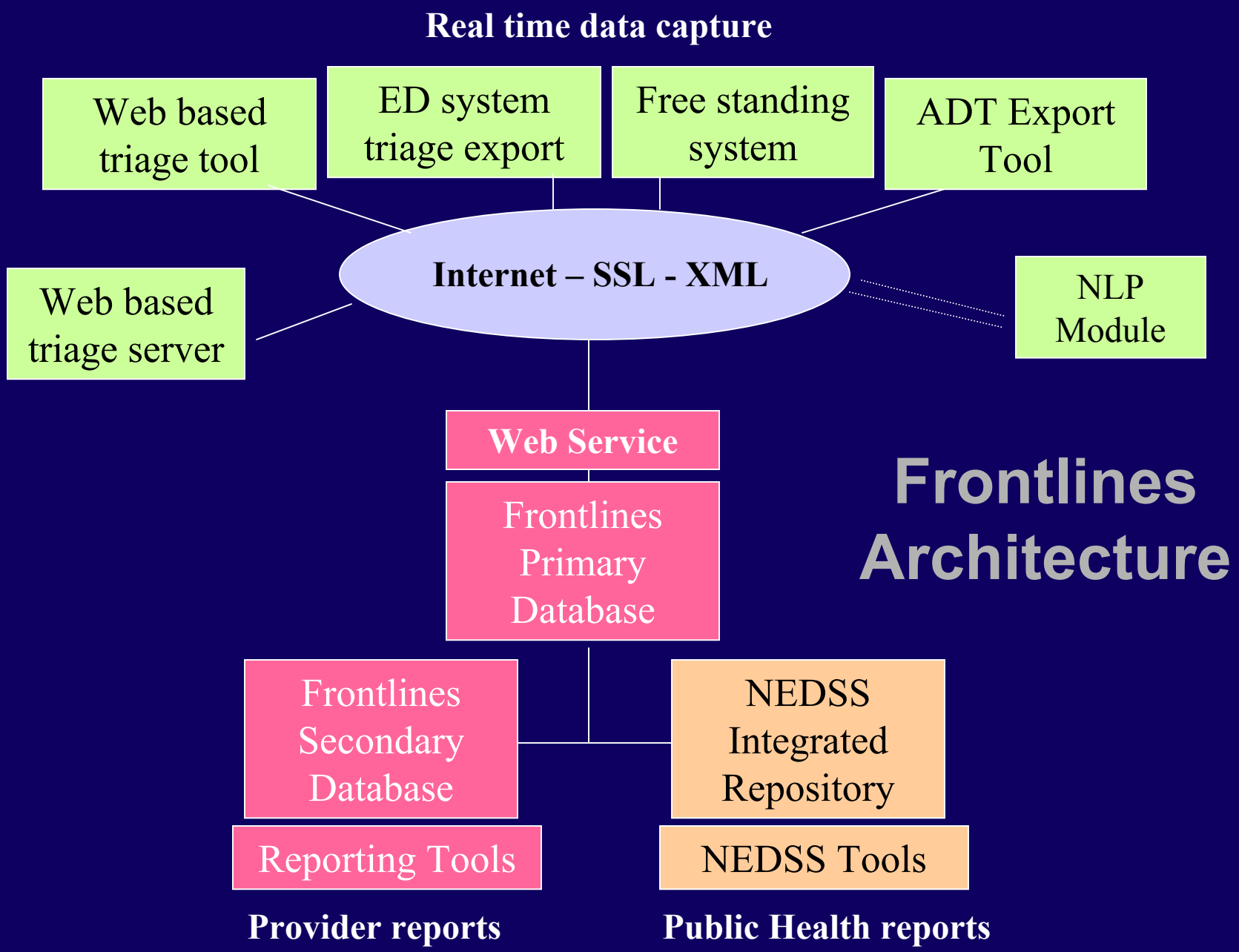

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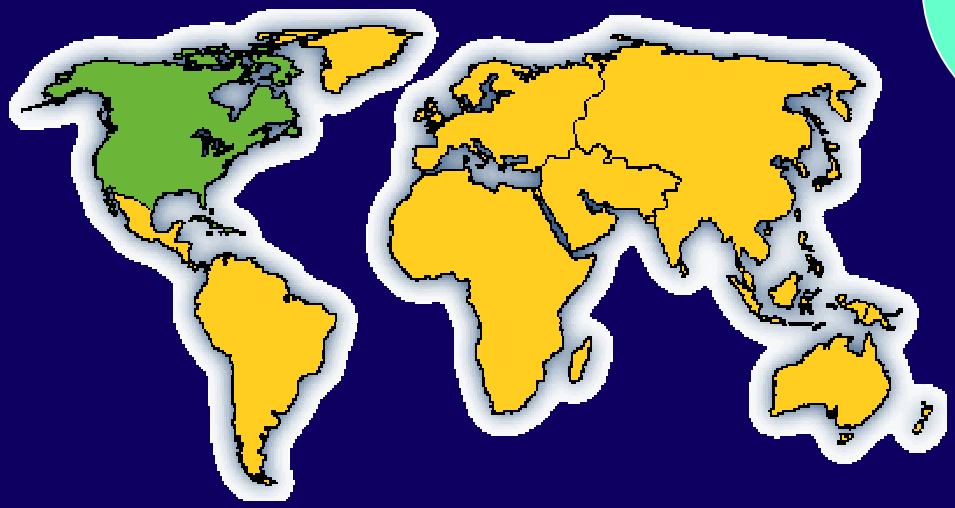
Frontlines Recommendations

Scalable…



Interlinked regional surveillance centers

Nationwide surveillance

Potential international applications

EMSystem

- All area hospital emergency departments linked via internet
- Hospital diversion information
- Mass casualty management
- Emergency visit registry to support public health

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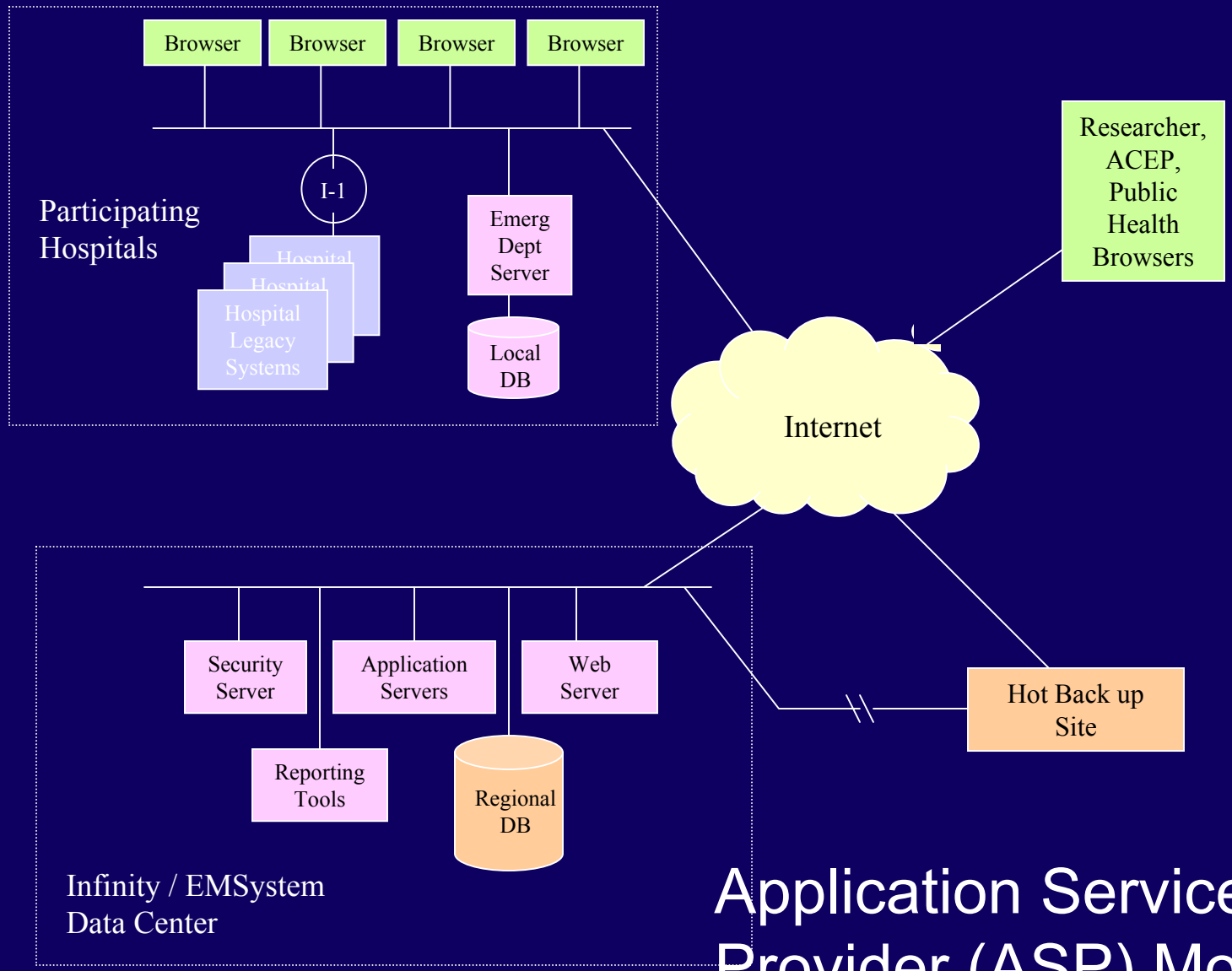

Application Service Provider (ASP) Model

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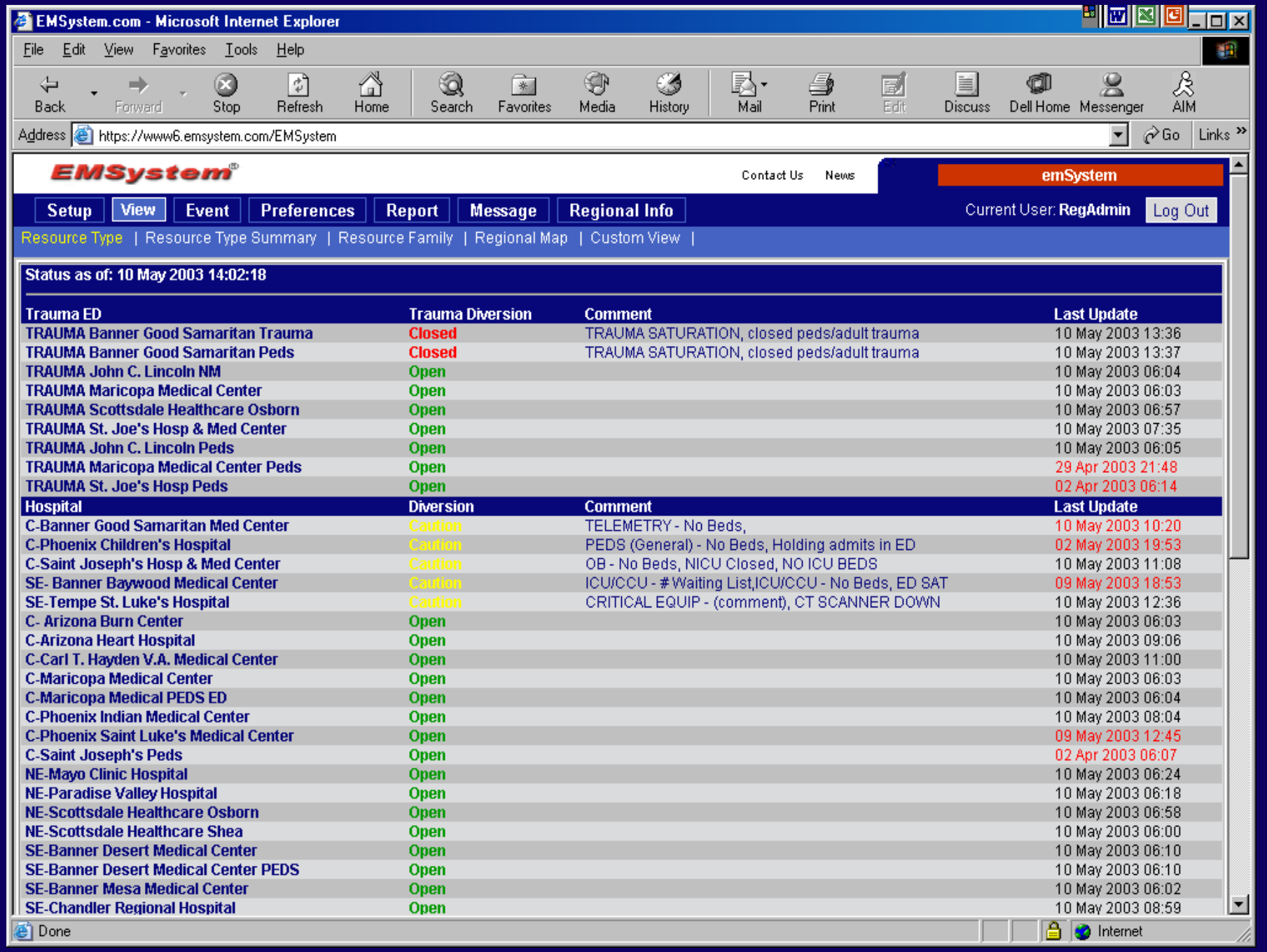

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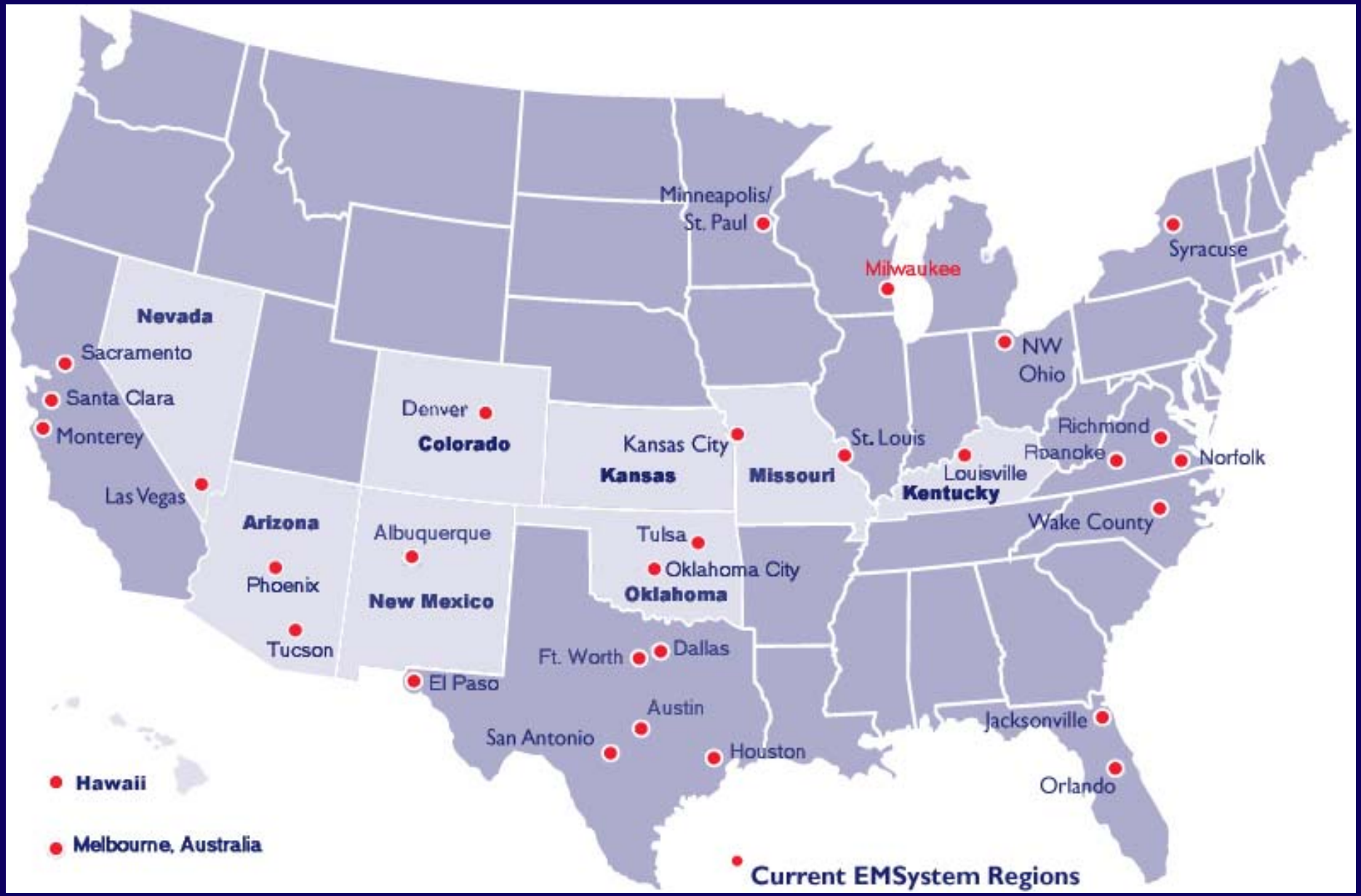

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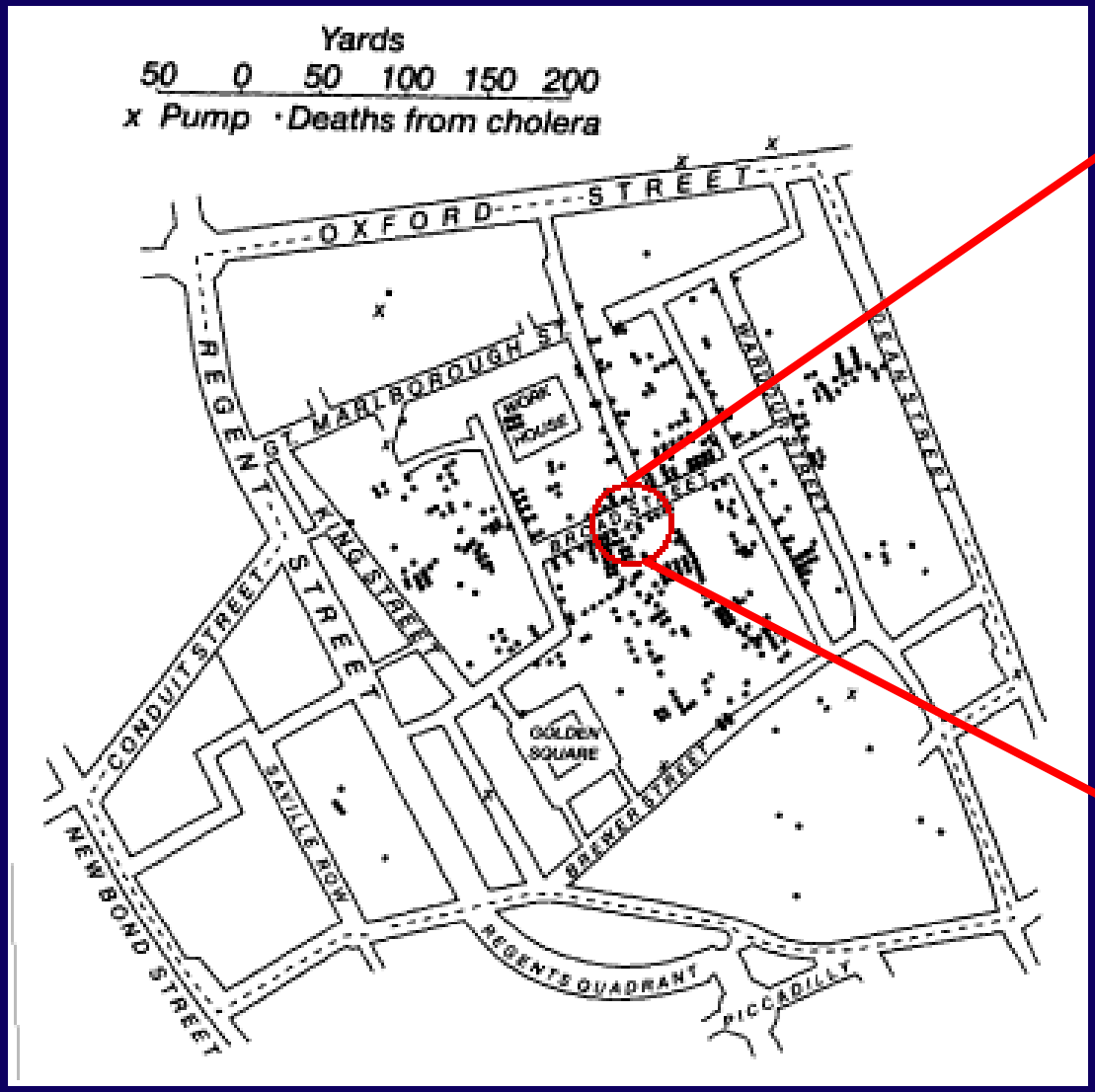
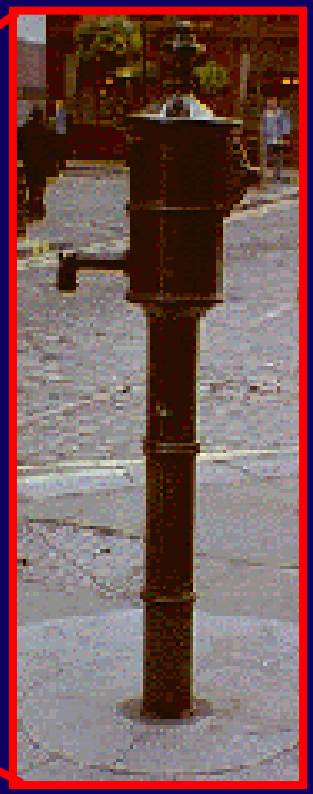
Syndromic Surveillance: John Snow & the Broad Street Pump





Milwaukee cryptosporidiosis outbreak – a model

- **March - April 1993**
- **Largest waterborne U.S. outbreak**
- **Contaminated reservoir**
- **Parasitic intestinal infection**
- **Over 400,000 people sick (52% attack rate)**

Diarrhea, 111 deaths

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Milwaukee cryptosporidiosis outbreak

Data source	Time following peak water turbidity, days	Signal-to-noise ratio
Symptoms at home (by telephone questionnaire)	6	13.2
ER Syndrome (GI) data	7	2.6
Illness in nursing homes	8	65.6
School absenteeism	9	5.1
Clinical laboratory tests	15	1485.7

Proctor, Epidem Infect, 1998

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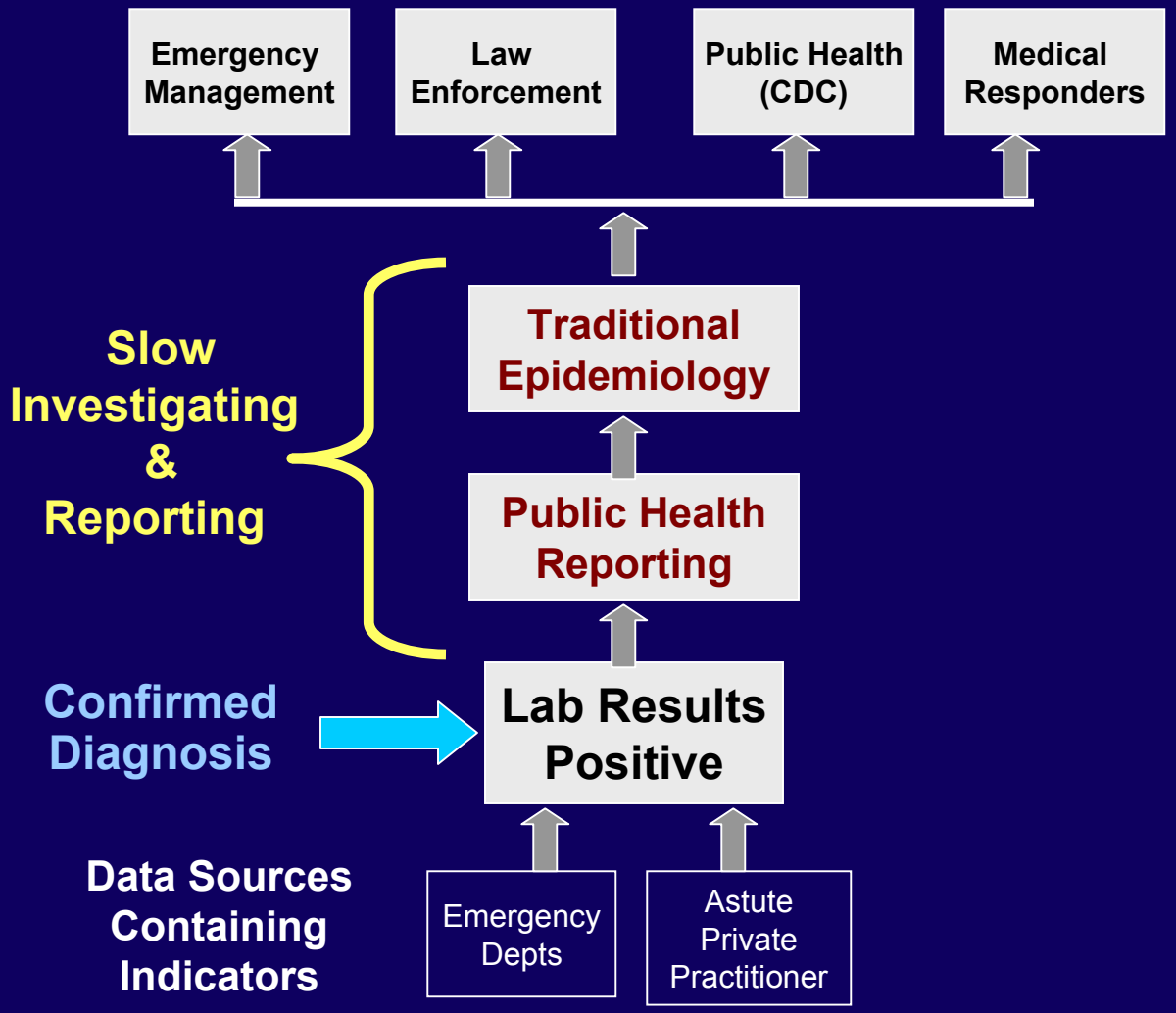
Current Surveillance Process

Information Systems Office

DARPA



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Emergency Syndromic Surveillance Potential Capabilities

- Ubiquitous in distribution
- 24 x 7 x 365
- Real time: much faster detection than waiting for labs / cultures
- Cost effective

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Capture Data

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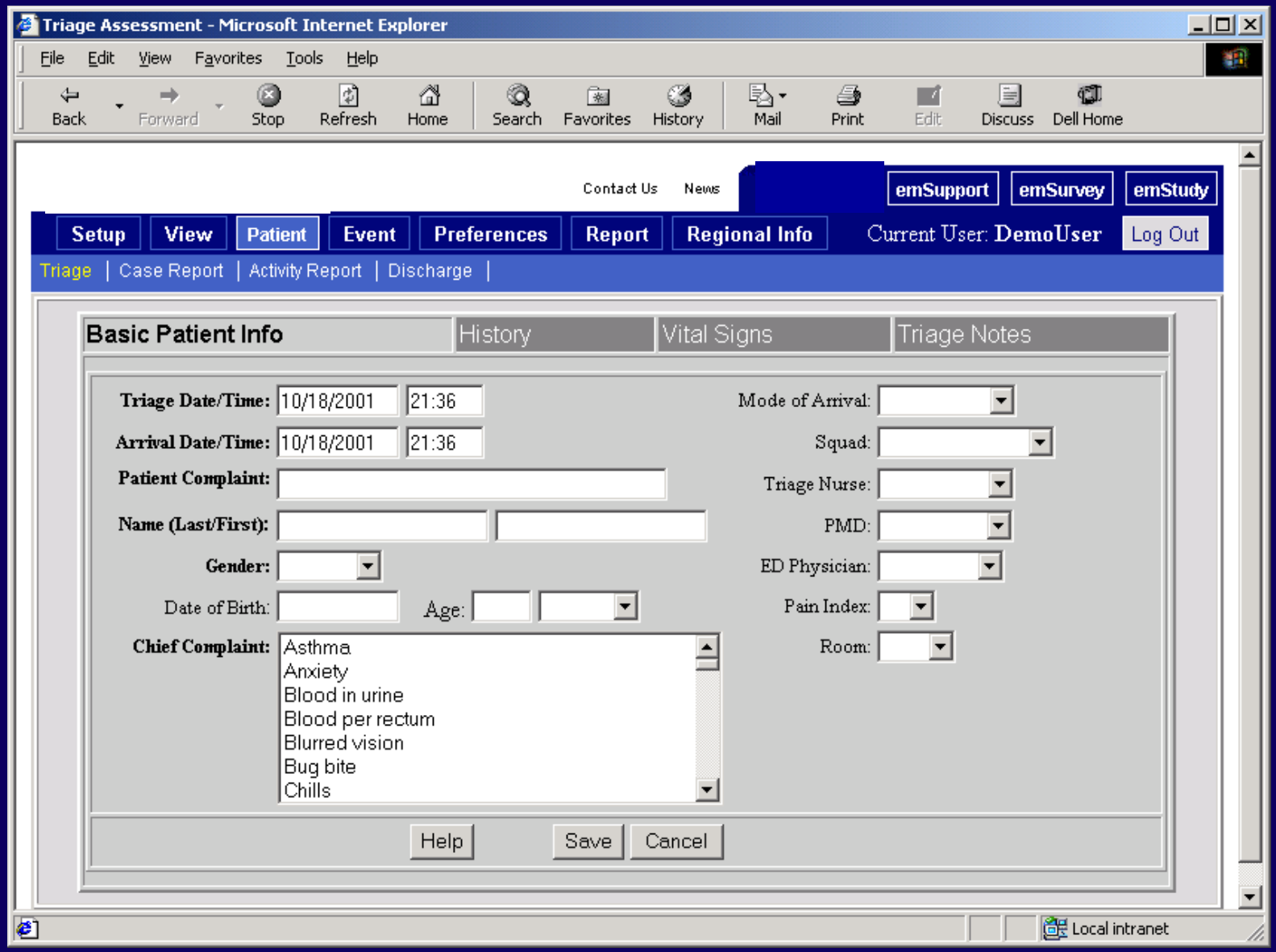
Universal Triage Form



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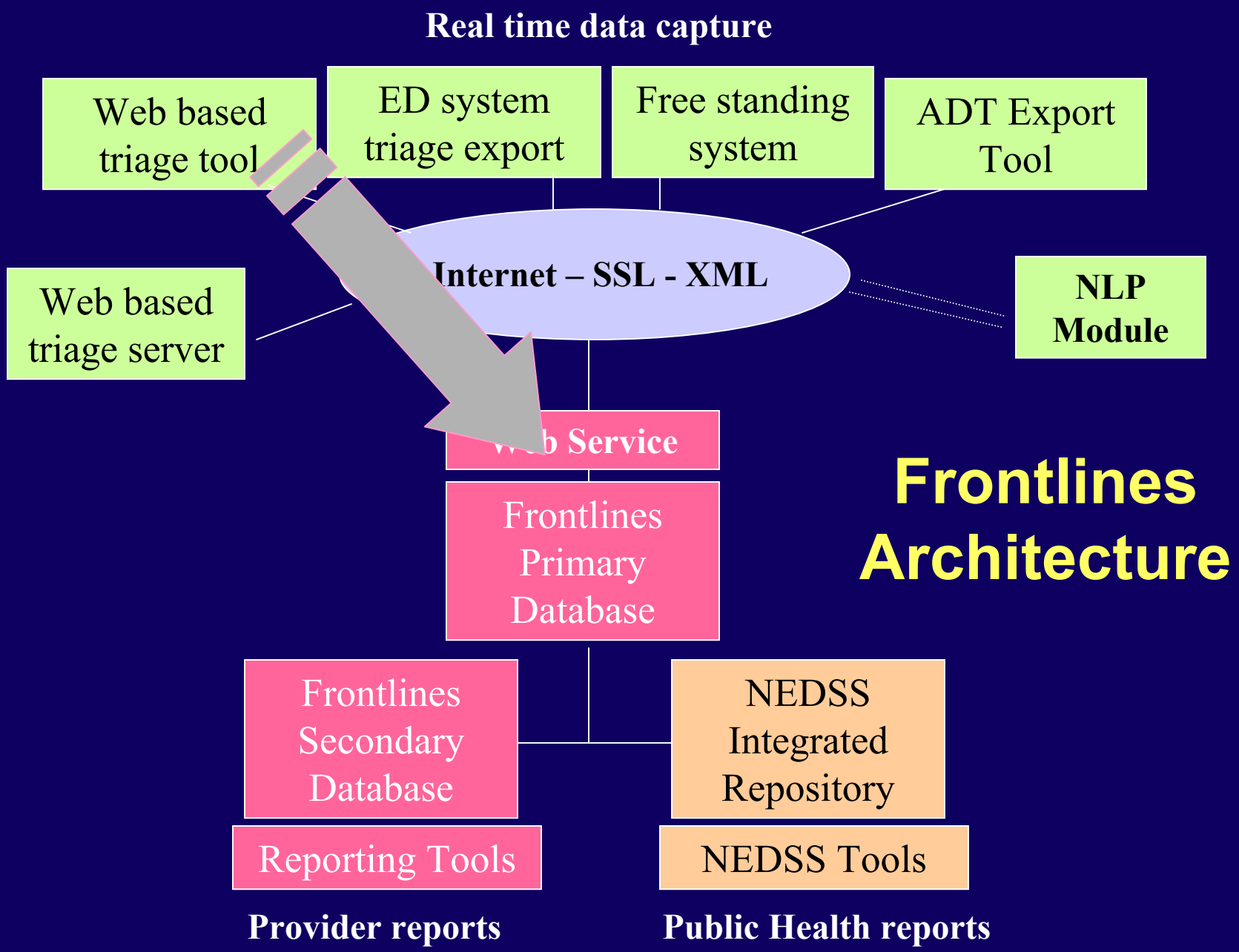

Frontlines Architecture

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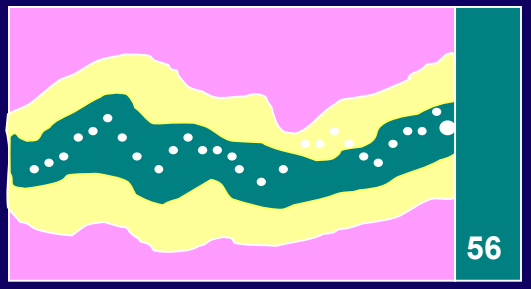
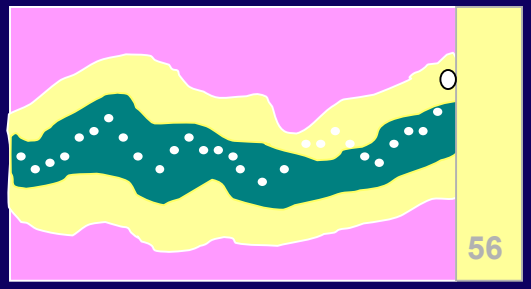
Conceptualization of Prevalence Reports - Dr. K Mandl

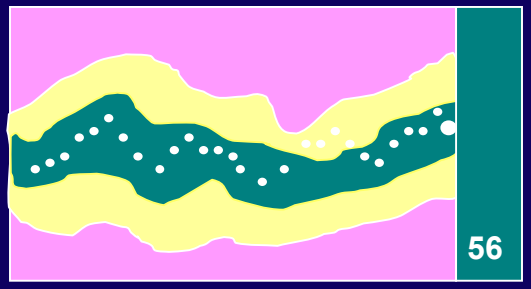
Adjusted Fever Visits



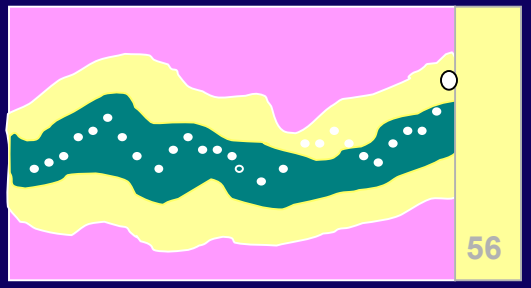
Adjusted Injury Visits



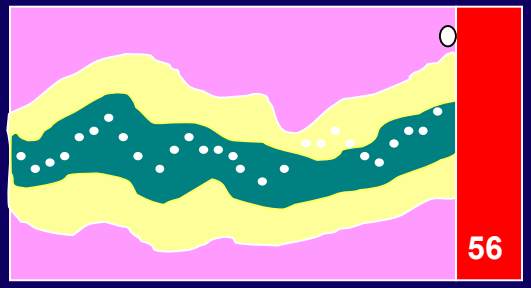
Adjusted M.I. Visits



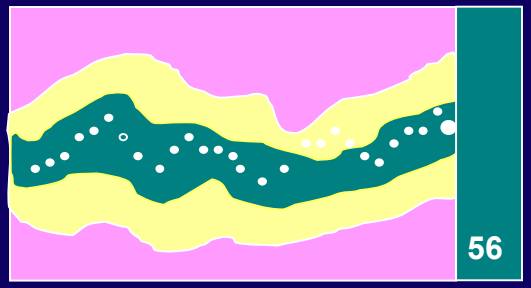
Adjusted Asthma Visits



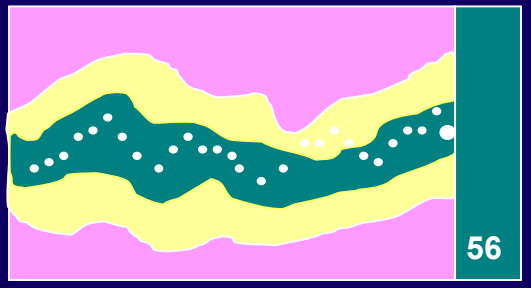
Adjusted Rash Visits



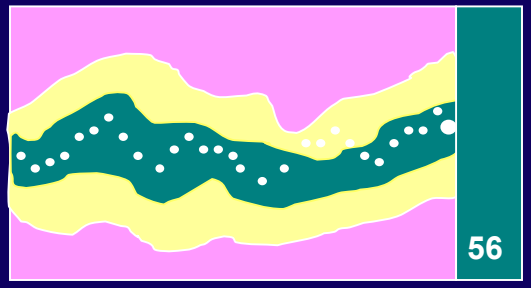
Adjusted Bleeding Visits



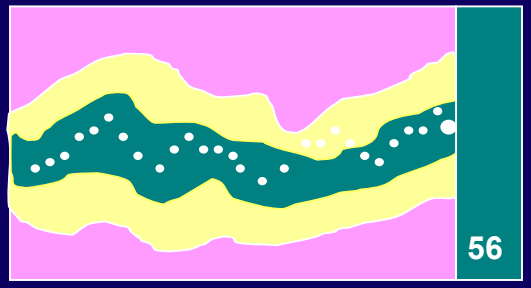
Adjusted Siezure Visits



Adjusted Psych Visits



Adjusted Stroke Visits



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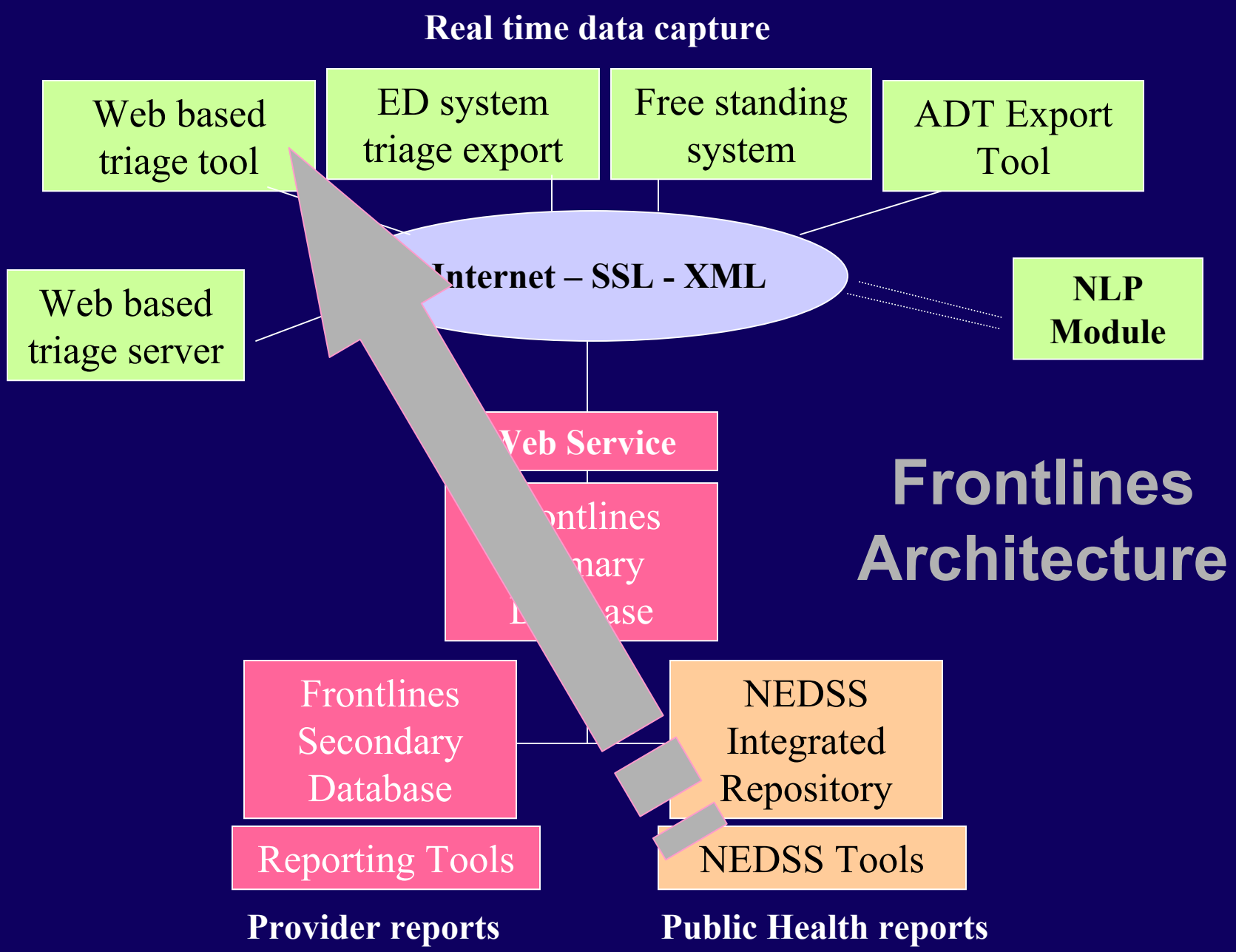

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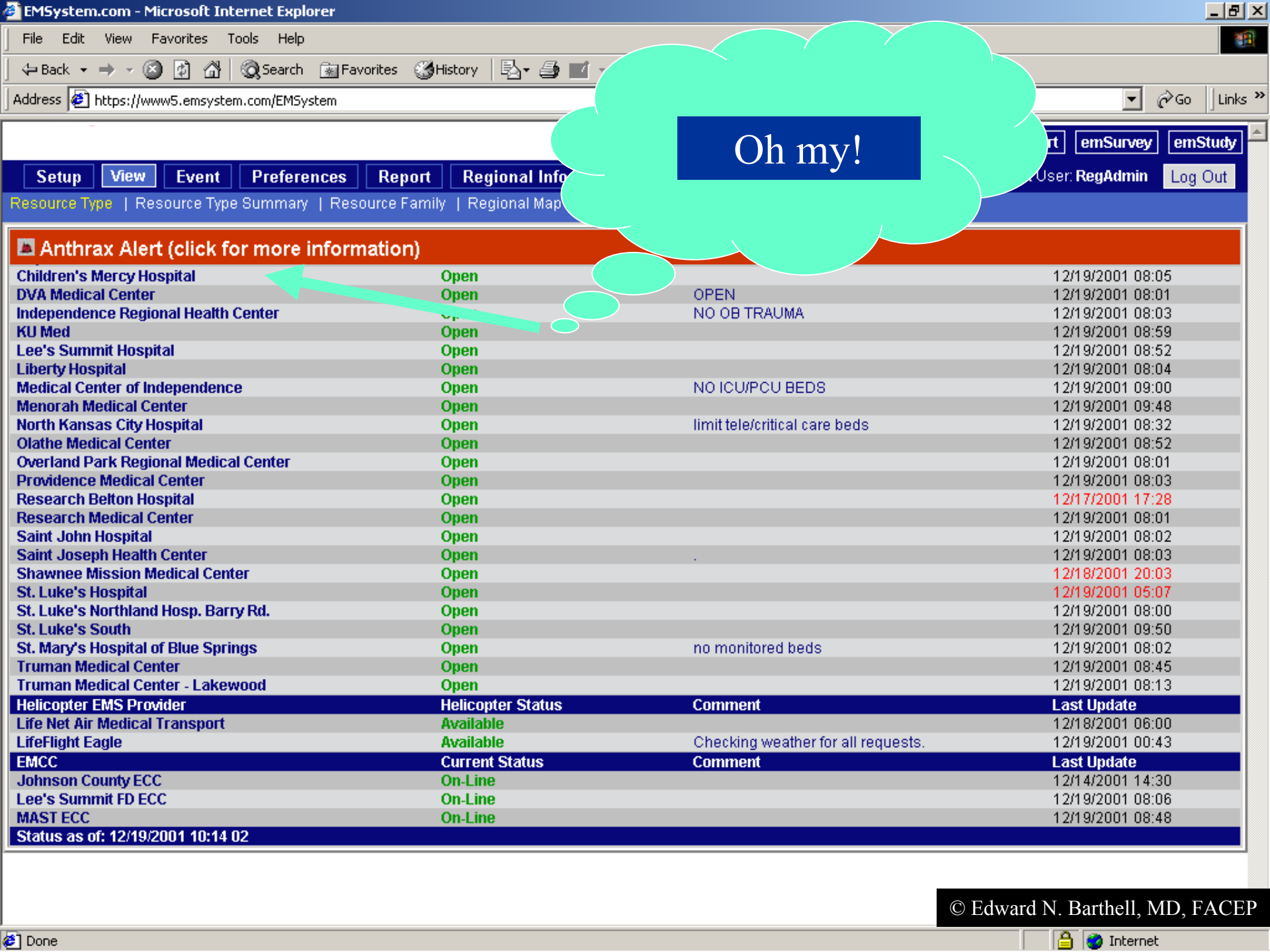
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Children's Mercy Hospital Open 12/19/2001 08:05
DVA Medical Center Open OPEN 12/19/2001 08:01
Independence Regional Health Center NO OB TRAUMA 12/19/2001 08:03
KU Med Open 12/19/2001 08:59
Lee's Summit Hospital Open 12/19/2001 08:52
Liberty Hospital Open 12/19/2001 08:04
Medical Center of Independence Open NO ICU/PCU BEDS 12/19/2001 09:00
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North Kansas City Hospital Open limit tele/critical care beds 12/19/2001 08:32
Olathe Medical Center Open 12/19/2001 08:52
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Saint Joseph Health Center Open . 12/19/2001 08:03
Shawnee Mission Medical Center Open 12/18/2001 20:03
St. Luke's Hospital Open 12/19/2001 05:07
St. Luke's Northland Hosp. Barry Rd. Open 12/19/2001 08:00
St. Luke's South Open 12/19/2001 09:50
St. Mary's Hospital of Blue Springs Open no monitored beds 12/19/2001 08:02
Truman Medical Center Open 12/19/2001 08:45
Truman Medical Center - Lakewood Open 12/19/2001 08:13
Helicopter EMS Provider Helicopter Status Comment Last Update
Life Net Air Medical Transport Available 12/18/2001 06:00
LifeFlight Eagle Available Checking weather for all requests. 12/19/2001 00:43
EMCC Current Status Comment Last Update
Johnson County ECC On-Line 12/14/2001 14:30
Lee's Summit FD ECC On-Line 12/19/2001 08:06
MAST ECC On-Line 12/19/2001 08:48
Status as of: 12/19/2001 10:14 02
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Resource Type | Resource Type Summary | Resource Family | Regional Map | Custom View | Event |

https://www5.emsystem.com/v2/upload/1282/Bioterrorism+Generic.pdf - Micros...

arding recognition of bioterrorism syndromes. Attached File

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BIOTERRORISM SYNDROMES

If you suspect disease from a potential bioterrorism event, call your local Public Health Office IMMEDIATELY:

your local Public Health Office will arrange for specialized lab testing; guidelines for treatment, prophylaxis, and infection control; and activate local, state, and federal emergency response systems.

Syndrome	Bioterrorism threat disease description	Differential diagnosis	Picture	Initial laboratory & other diagnostic test results	Immediate public health & infection control actions
Acute Respiratory Distress with Fever	**Inhalational Anthrax** Abrupt onset of fever, chest pain, respiratory distress without radiographic findings of pneumonia, no history of trauma or chronic disease, progression to shock and death within 24-36 hours.	Dissecting aortic aneurysm, pulmonary embolism, influenza		Chest x-ray with widened mediastinum; gram-positive bacilli in sputum or blood; definitive testing available at the state local Public Health Laboratory.	Call your local your laboratory No person-to Infection cont
	Pneumonic Plague Apparent severe community-acquired pneumonia but with hemoptysis, cyanosis, gastrointestinal symptoms, shock.	Community-acquired pneumonia, Hantavirus pulmonary syndrome, meningococcemia, rickettsiosis, influenza		Gram-negative bacilli or coccobacilli in sputum, blood or lymph node; safety-pin appearance with Wright or Giemsa stain; definitive testing available at the state local Public Health Laboratory.	Call hospital local Public Health Agency; close co hospital (if alre interview/cher address and Alert laborator Infection cont addition to st
	Ricin (aerosolized) Acute onset of fever, chest pain and cough, progressing to respiratory distress and hypoxemia; not improved with antibiotics; death in 36-72 hours.	Plague, Q fever, staphylococcal enterotoxin B, phosgene, tularemia, influenza		Chest x-ray with pulmonary edema. Consult with your local Public Health office regarding specimen collection and diagnostic testing procedures.	Call your local Infection cont
	Staphylococcal Enterotoxin B Acute onset of fever, chills, headache, nonproductive cough and myalgia (influenza-like illness) with a NORMAL chest x-ray.	Influenza, adenovirus, mycoplasma		Primarily clinical diagnosis. Consult with your local Public Health office regarding specimen collection and diagnostic testing procedures.	Call your local Infection cont
Acute Rash with Fever	**Smallpox** Papular rash with fever that begins on the face and extremities and uniformly progresses to vesicles and pustules; headache, vomiting, back pain, and delirium common.	Varicella, disseminated herpes zoster, vaccinia, monkeypox, cowpox		Clinical with laboratory confirmation; vaccinated, gowned and gloved person obtains specimens (scabs or swabs of vesicular or pustular fluid). Call your local Public Health office immediately before obtaining specimen; definitive testing available through CDC.	Call hospital local Public H Ask family m patient to stay present for p vaccination; phone numbe Infection cont precautions in cautions.
	Viral Hemorrhagic Fever (e. g., Ebola) Fever with mucous membrane bleeding, petechiae, thrombocytopenia and hypotension in a patient without underlying malignancy.	Meningococcemia, malaria, typhus, leptospirosis, tularemia, thrombotic thrombocytopenic purpura (TTP), hemolytic uremic syndrome (HUS)		Definitive testing available through your local Public Health Laboratory network--call your local Public Health office immediately.	Call hospital infection control and your local Public Health office immediately. Ask family members/close contacts of patient to stay at the hospital (if already present) for public health interview and follow-up; get detailed address and phone number information. Infection control: contact precautions in addition to standard precautions.
	Botulism Acute bilateral descending flaccid	Guillain-Barré syndrome,		CSF protein normal; EMG with repetitive	Request botulinum antitoxin from your local

Take action to improve the situation ….

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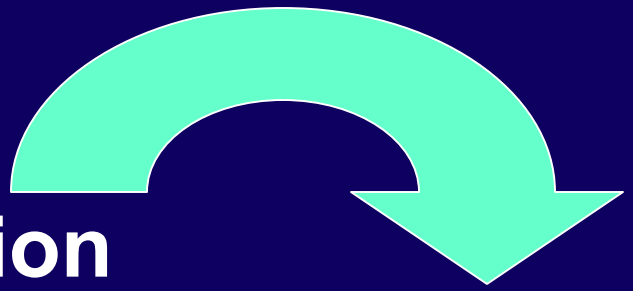
Evolving Model of Surveillance

Simple Data Collection and Analysis



A Tiered Interactive Communication System

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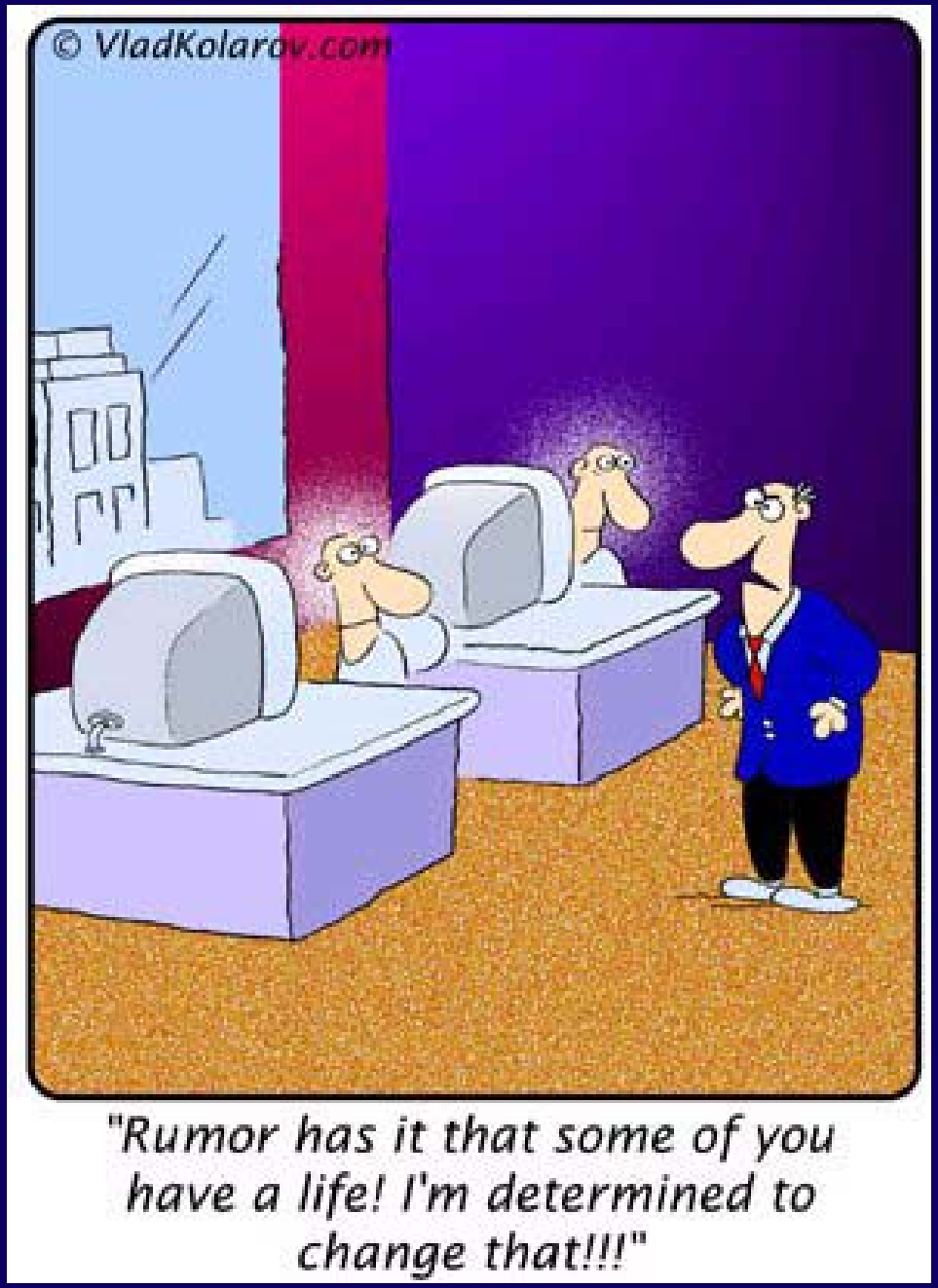

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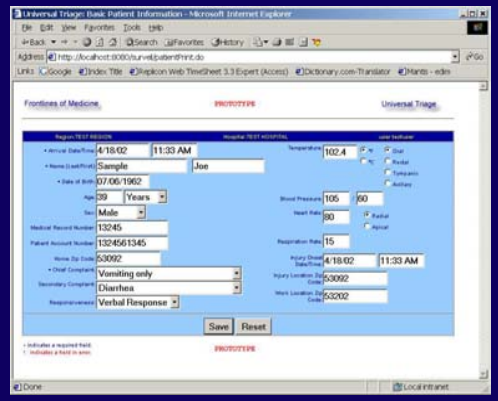
SARS – A Real World Example



Universal Triage: Print Patient Information - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://localhost:8080/surveil/patientInfo.do

Links Google Index Title Replicon Web TimeSheet 3.3 Expert (Access) Dictionary.com-Translator

Universal Triage: Print Patient Information

4/18/02 AT 11:33 AM — **Emergency Department**

Name (Last/First): **Sample, Joe**

Date of Birth: **07/06/1962** Age: **39 years** Sex: **M**

Chief Complaint: **Vomiting only**

Diarrhea

Allergy:

Medications:

Last Tetanus: _____ # OF YEARS: _____

TIME	BP	TEMP	HEART RATE	RESP RATE
11:33 AM	105 / 60	102.4 F	80	15

PRIORITY: 1 2 3 LOCATION: REG ED CLINIC: _____

APPROVING PHYSICAN NOTIFIED: YES NO TIME: _____

SQUAD: _____ POLICE NOTIFIED : YES NO TIME: _____

TRIAGE NURSE SIGNATURE: _____

SUBJECTIVE:

New Patient

Done Local intranet

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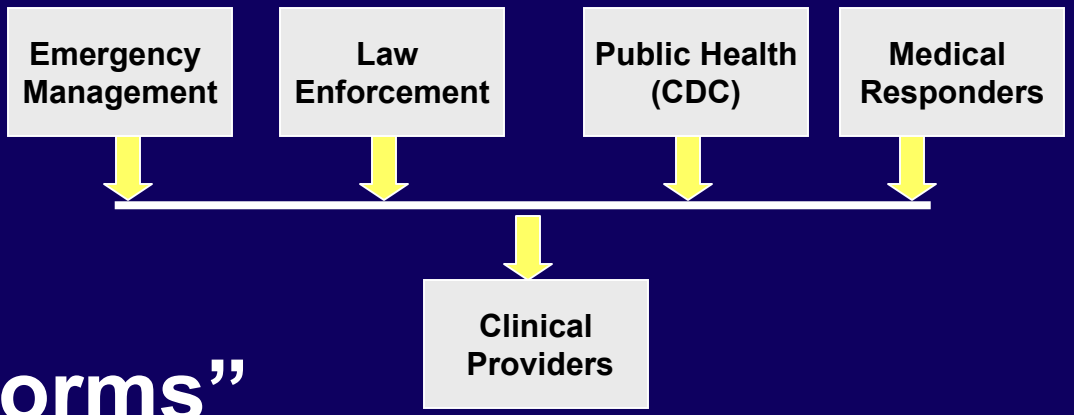
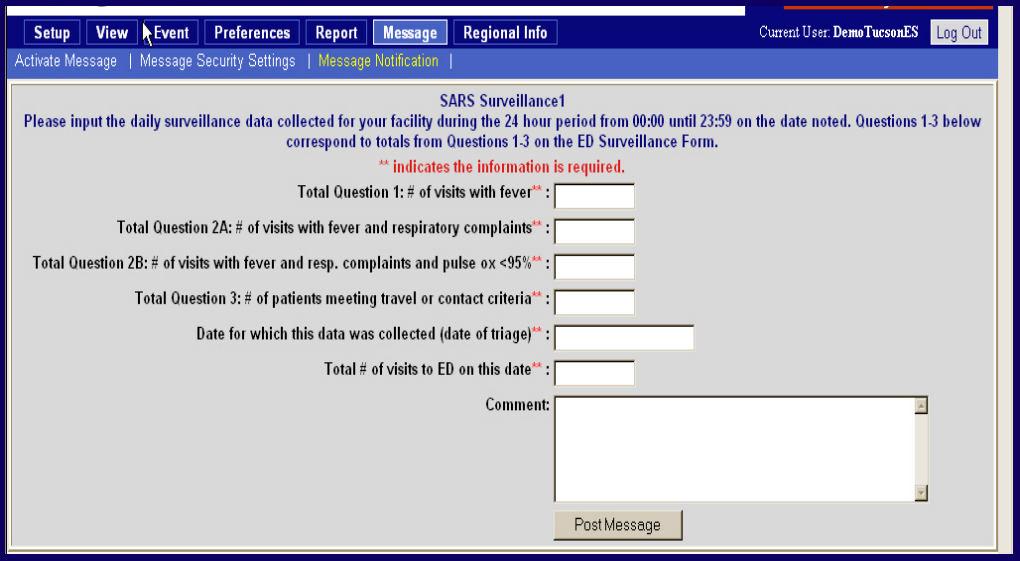
Surveillance – Volume Based using EMSystem



"Agile Forms"



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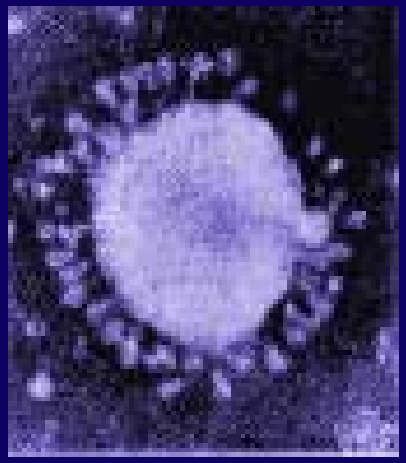
SARS Surveillance – EMSystem

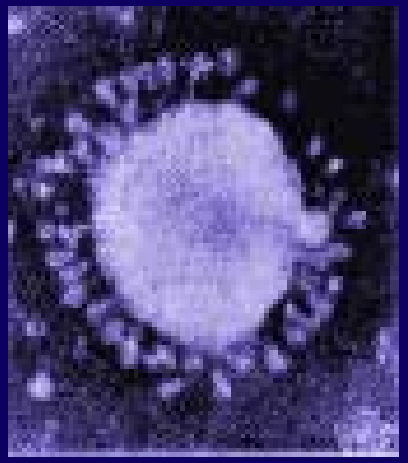
Sun Mar 16th – Initial conference call

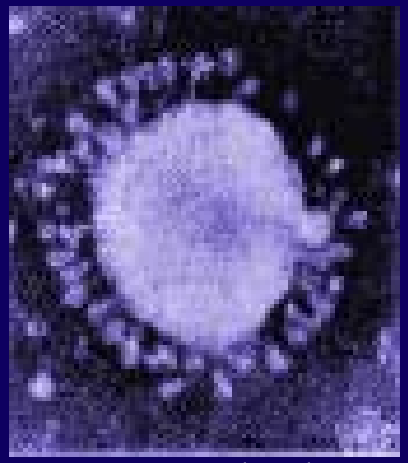
Mon Mar 17th – Agreement on data to be collected

Tues Mar 18th – Nurse mgr notification

Wed Mar 19th – Data collection begins







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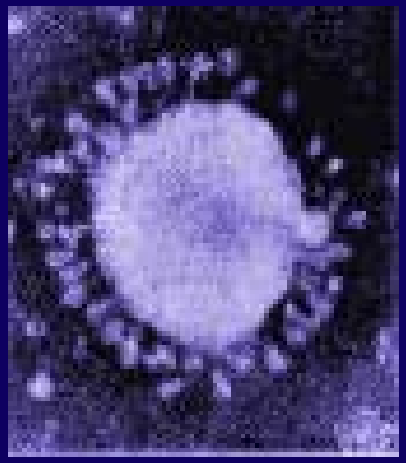
SARS Surveillance – EMSystem

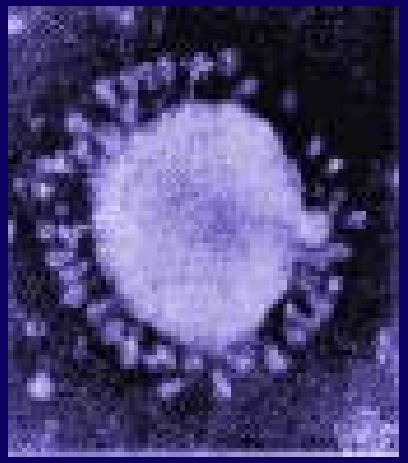
Milwaukee

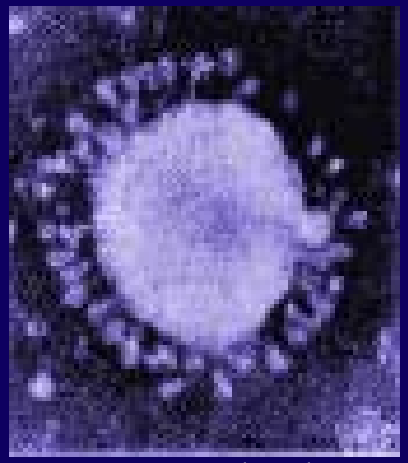
Denver

Fort Worth

Akron







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SEVERE ACUTE RESPIRATORY SYNDROME (SARS)
EMERGENCY DEPARTMENT SURVEILLANCE FORM

Complete this form for every patient with FEVER.

- **Apply patient stamp (addressograph) to upper right corner of form**
- **Visit Date:_____**
- **Check YES or NO as applicable**

1	Does the patient have fever (>38 degrees Celsius, >100.4 degrees Fahrenheit)?	YES ❑ GO TO 2a	NO ❑ STOP
2 a	Does the patient have respiratory complaints (cough, shortness of breath, difficulty breathing, or current pneumonia/ARDS)?	YES ❑ GO TO 2b	NO ❑ GO TO 2b
2 b	Is the patient's pulse oximetry reading < 94% while on room air?	YES ❑ GO TO 3	NO ❑ GO TO 3
3	Travel to **People's Republic of China (both mainland China and Hong Kong); Hanoi, Vietnam; and/or Singapore** within the 10 days preceding symptom onset? **OR** Close contact with a person meeting criteria 1, 2 and 3 within the 10 days preceding symptom onset? (Close contact = cared for, lived with or direct contact with respiratory secretions or body fluids)	YES ❑ GO TO 4	NO ❑ STOP
4	If the answer to questions 1 **AND** (2a **OR** 2b), **AND** 3 are **ALL** yes, follow the instructions below:		

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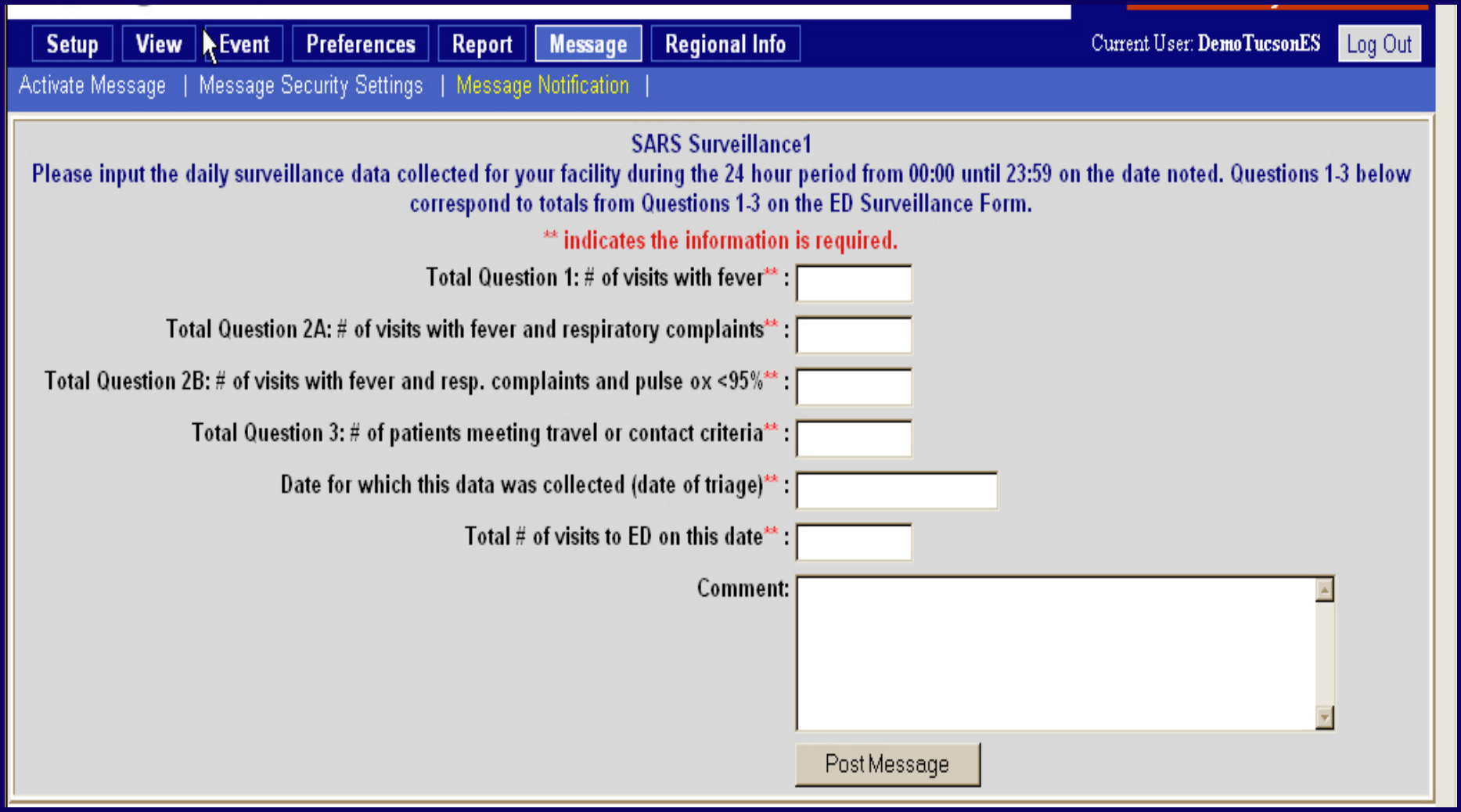

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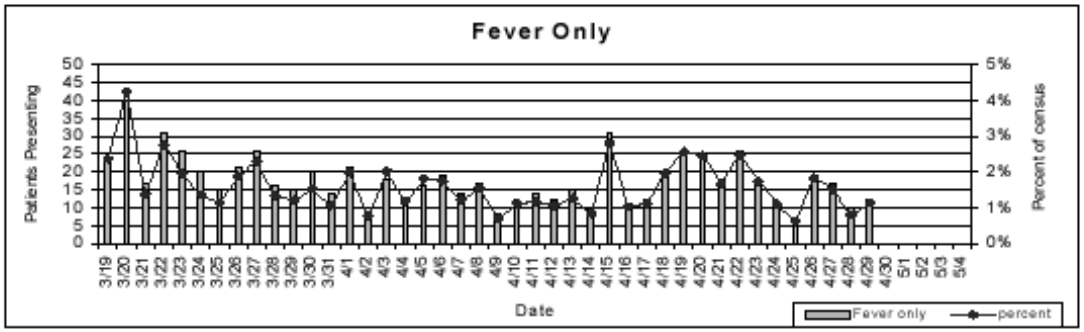
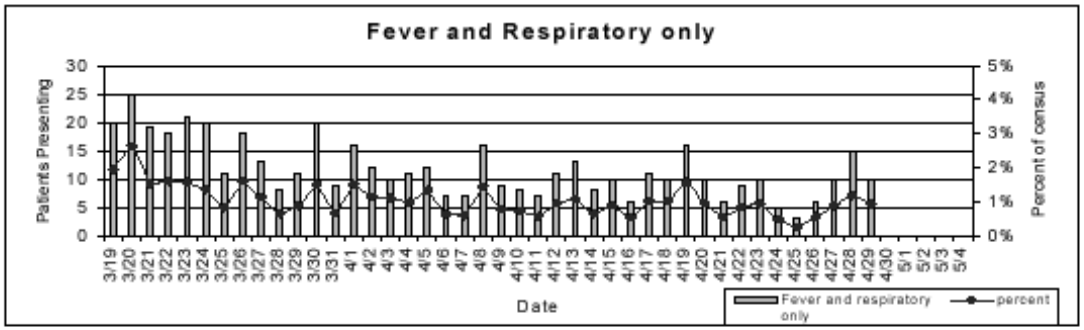
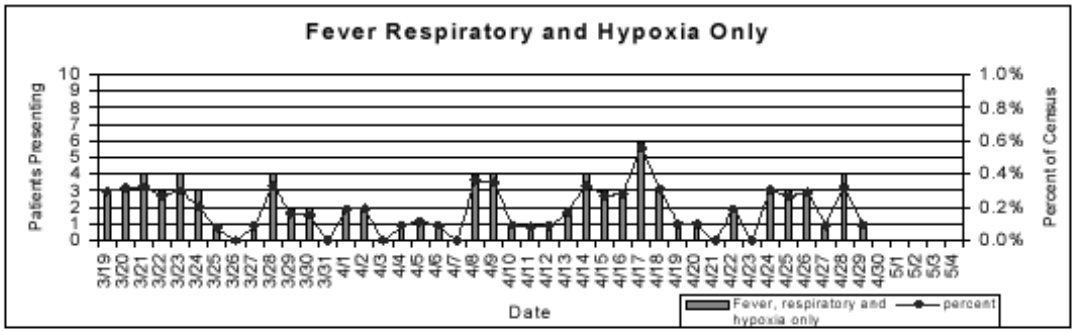
Severe Acute Respiratory Syndrome (SARS) Surveillance Project Report

April 30, 2003

Number of Participants = 11







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SARS Surveillance – Lessons Learned

- **Experience makes a difference -**
  - **Daily use of networked system**
  - **Prior use of survey technique**
- **Involve local public health -**
  - **Champion, esp with nurse mgrs**
  - **Data oversight to pick up mistakes**
- **Ongoing feedback to clinicians**

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SARS Surveillance – Lessons Learned

- **Data collection must be part of work flow**
  - **No added steps to work process**
  - **No new data points**
  - **No "judgment calls" for staff**
- **Staff buy-in**
- **Process must take into account both ambulatory and ambulance patients**

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Evolving Model of Surveillance

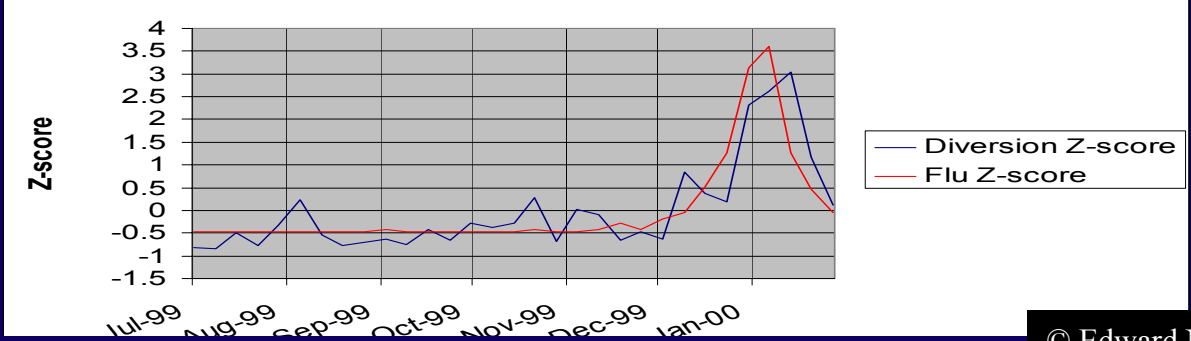
Detection

Analysis

Investigation

Response

Measurement of Effect



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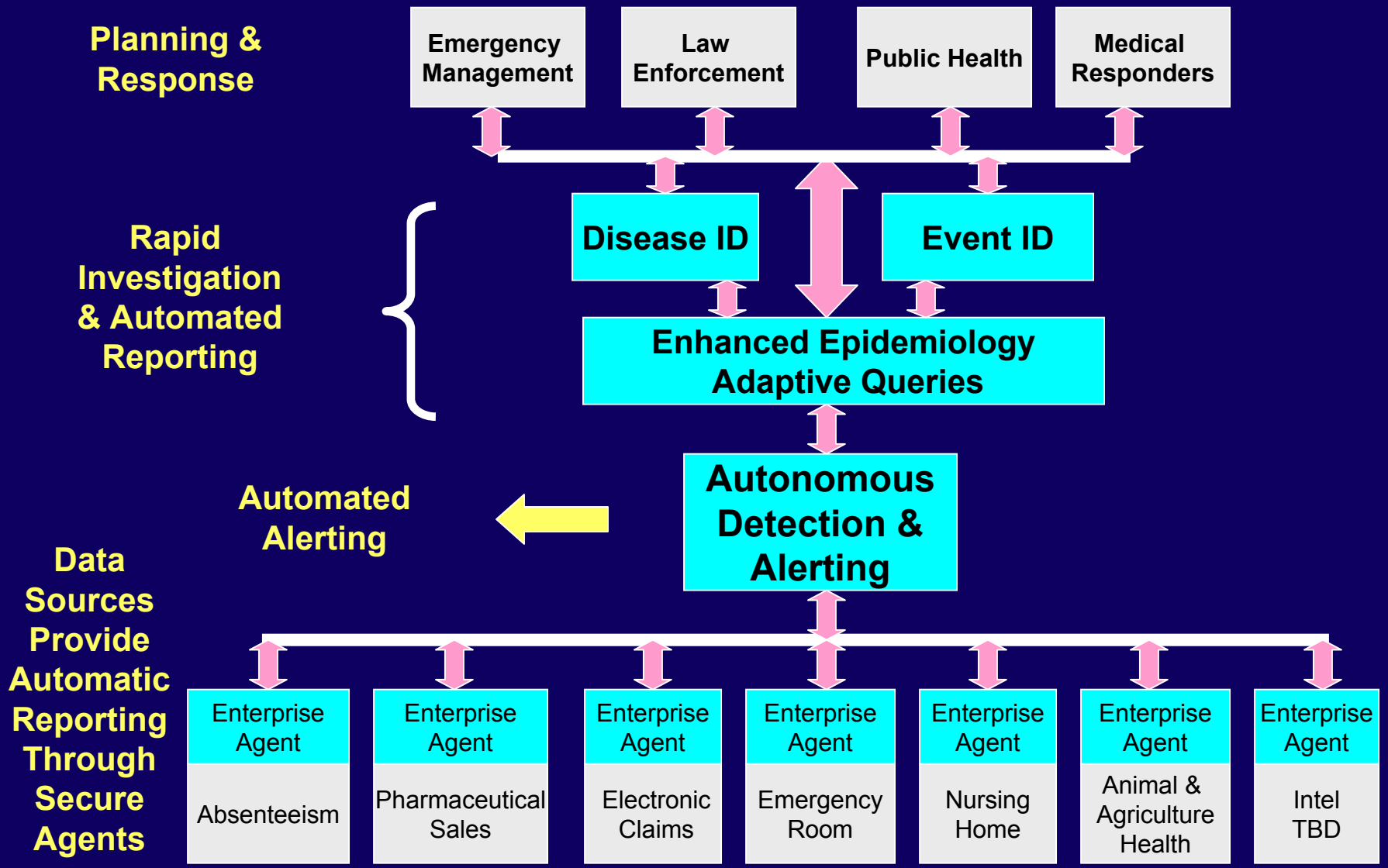
Interactive Surveillance



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Future Rich Data Surveillance

- Demographics
- EMS
- Prior Medical Records
- Financials
- Laboratory
- X-ray
- Insurance
- Inventory
- Pharmacy
- Electronic charting
- Monitors
- Care Pathways
- Quality Assurance
- Order Entry / Result Reporting

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Knowledge

- created when torrential streams of data are channeled and managed using appropriate tools and techniques

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Beautiful...

and Functional !

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The best way to predict the future…

is to invent it !

Alan Kay

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"It's kind of fun to do the impossible."

- Walt Disney (1901-1966)

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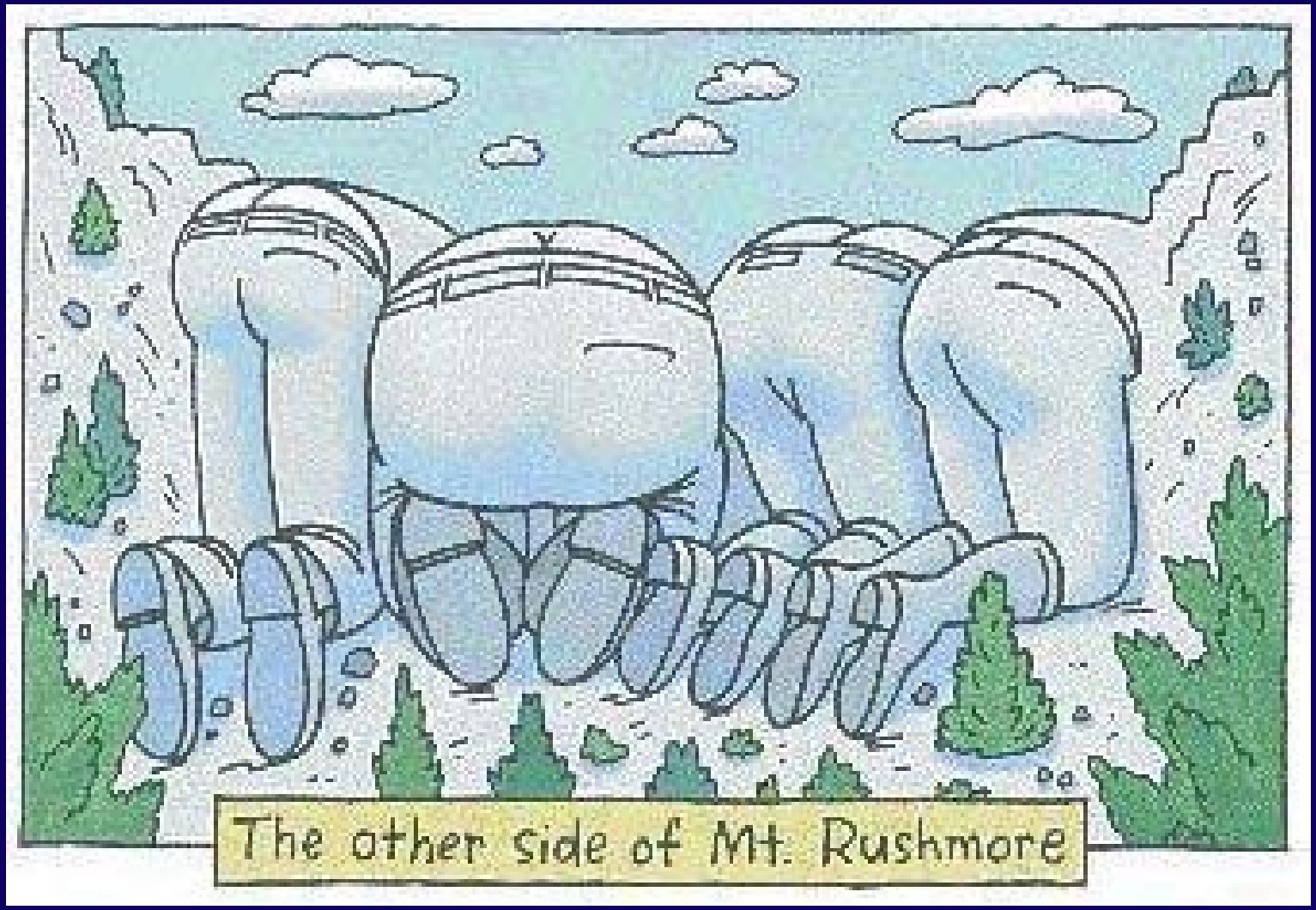
Questions ???



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