Designing an Architecture for Messaging Clinical Data

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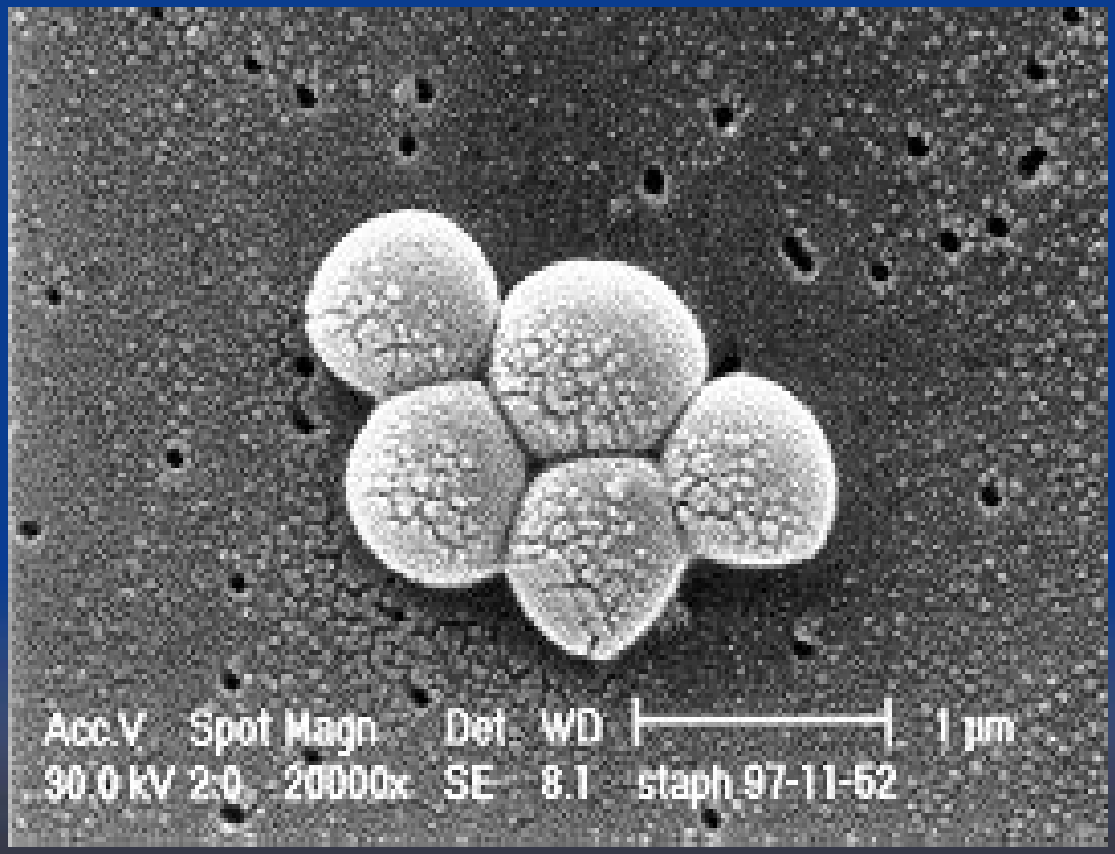
National Healthcare Safety Network eSurveillance Project Background

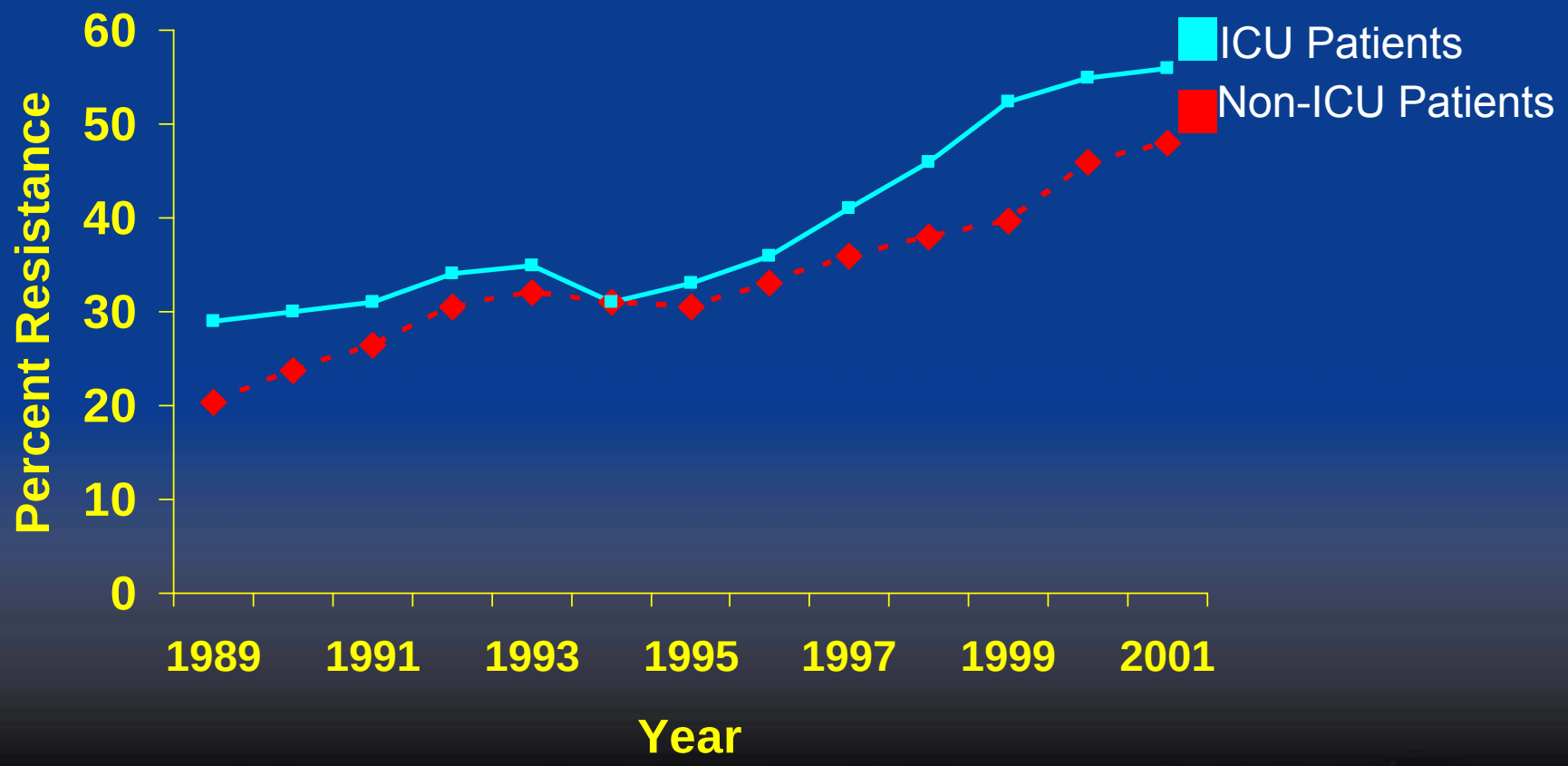
- NCID Antimicrobial Resistance Working Group Funded Project
- Collects electronic Pharmacy, Microbiology and Admission Discharge Transfer Data
- Collaboration with Healthcare Institutions
- Collaboration with Healthcare Information System vendors Theradoc and Biomeriux

NHSN
National Healthcare Safety Network

Methicillin-resistant *S. aureus* (MRSA) Isolate

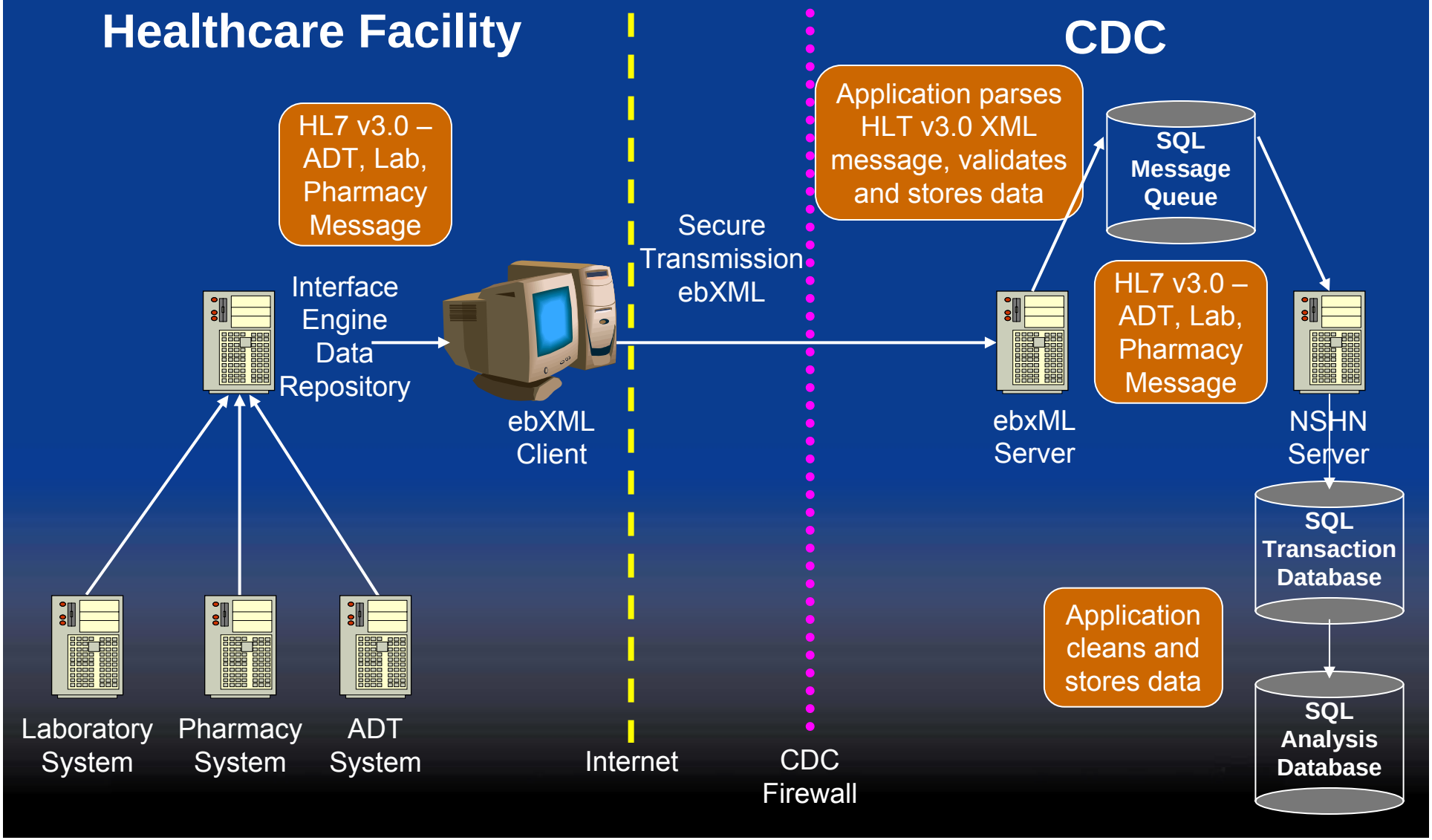


Hospital Setting: Proportion of *S. aureus* Nosocomial Infections Resistant to Oxacillin (MRSA), by ICU Status

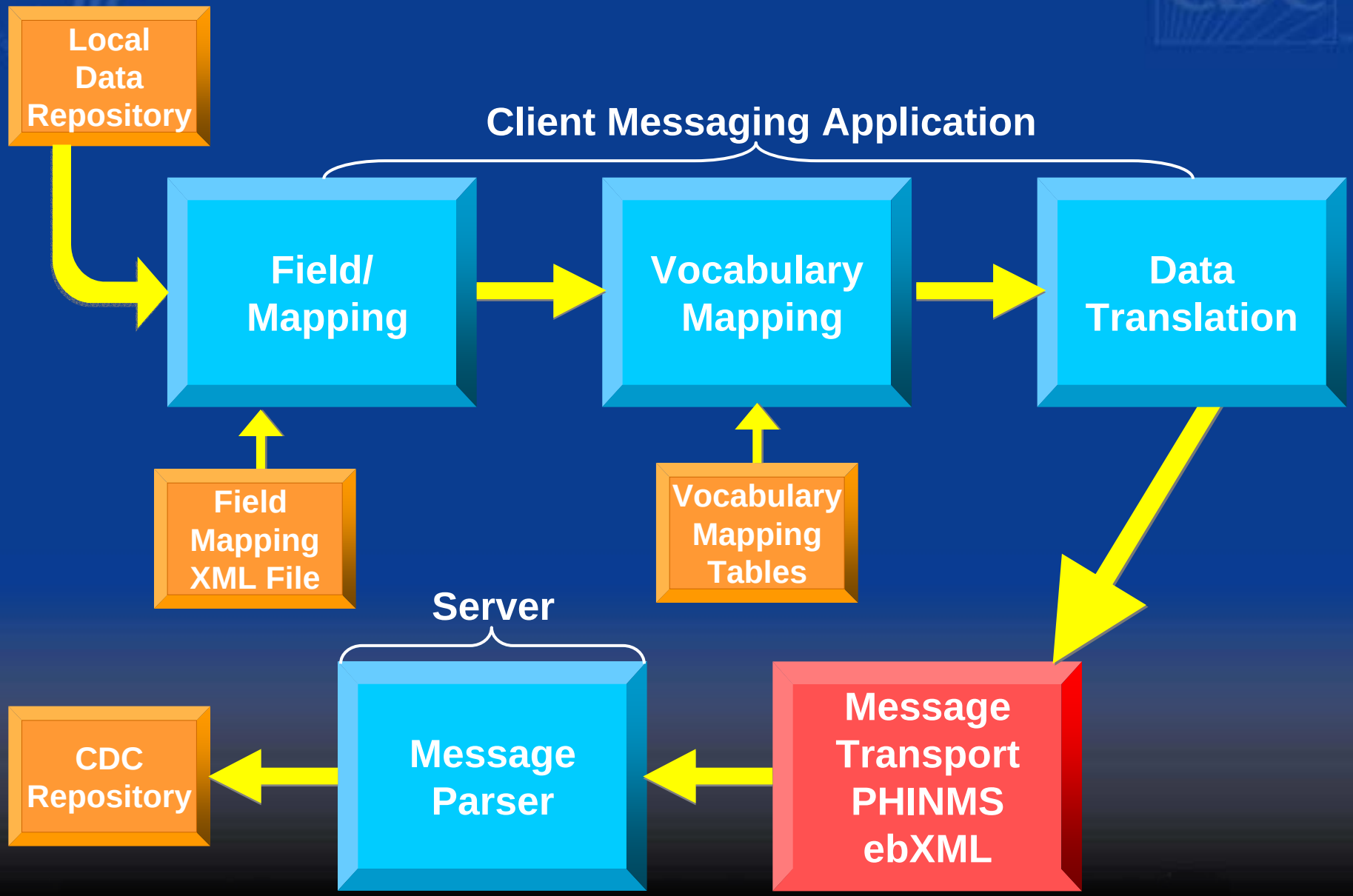


Source: NNIS DATA, Clinics Chest Med: 20:303-315

NHSN eSurveillance Messaging Architecture



NHSN eSurveillance Software Architecture



Identity Management

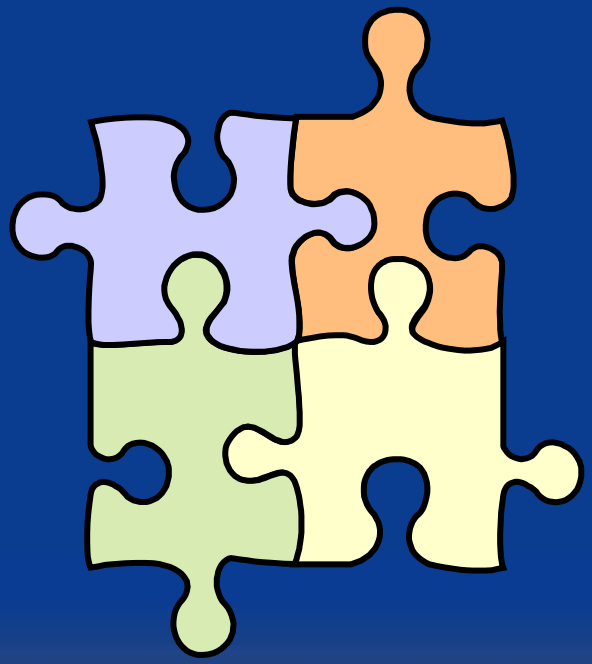
eSurveillance

- Has Public Health Law and confidentiality protections for healthcare data
- Requires a unique identifier for a patient
- Patient name is optional

Solutions

- Encrypt identifier
- Store mapping to identifier in local database

Myth – All HL7 v2.x Messages are compatible



Message Structure

eSurveillance

- Uses HL7 v3 messages
- Helping to develop a HL7 v3 specification that will allow uniform data collection and interoperability across healthcare
- Based upon object-oriented modeling technology
- HL7 v3 message are tied to the HL7 Reference Information Model
- XML is the Implementation Technology
- Still in the ballot process

Myth – Vocabulary mapping is unnecessary

Mapping Standard Vocabularies

eSurveillance

- Uses HL7 v3, SNOMED, LOINC, UMLS, and RXNORM Terminologies
- SNOMED organism matching algorithm matches about 70% of local facilities organisms
- Developed vocabularies where they do not already exists

Solutions

- Improve matching algorithm to allow ranking
- Build library of mapped codes
- Use PHIN Vocabulary Web Services
- Incorporate standard vocabularies into vendor products

Pharmacy Dispensing Frequency

Interval	Description	Wenkai's GTS Literal Form
TID	3 times a day	H/8
QM-F	every Monday thru Friday	J1;J2;J3;J4;J5

Data Translation

eSurveillance

- Client Messaging Application converts data from internal format into the hierarchical HL7 v3 message structure using XSLT
- Server Message Parser uses a Document Object Model (DOM) Parser

Solution

- Use of automated data binding tools such as Sun's JAXB to build parsers based on XML schemas

Knowledge System & Data Reporting

SAS Output - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address C:\Documents and Settings\jst2.NCID\Desktop\SAS Output - summary.htm

National Health Safety Network
AUR Summary of E-Surveillance Data
Facility: 10000 - University of Utah Hospital

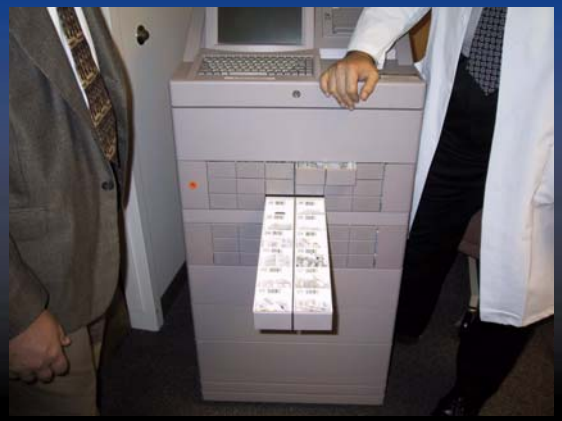
Bug	Drug	S	I	R	Total Tested	% Susceptible	% Non-Susceptible
Acid-fast bacillus		0	0	0	30	0	0
Acinetobacter species		0	0	0	2	0	0
	AMIKACIN	4	0	0	4	100	0
	AMOXICILLIN+ CLAVULANATE	0	0	1	1	0	100
	AMPICILLIN	0	0	1	1	0	100
	AMPICILLIN+ SULBACTAM	2	1	0	3	67	33
	CEFAZOLIN	0	0	1	1	0	100
	CEFOTAXIME	0	0	1	1	0	100
	CEFOXITIN	0	0	1	1	0	100
	CEFTAZIDIME	3	0	0	3	100	0
	CEFUROXIME	0	0	1	1	0	100
	CIPROFLOXACIN	1	0	3	4	25	75
	GENTAMICIN	1	1	2	4	25	75
	IMIPENEM	3	0	0	3	100	0
	MEROPENEM	1	0	0	1	100	0
	MINOCYCLINE	2	0	1	3	67	33
	PIPERACILLIN	1	0	2	3	33	67
	PIPERACILLIN+ TAZOBACTAM	0	0	1	1	0	100
	TRIMETHOPRIM+ SULFAMETHOXAZOLE	2	0	2	4	50	50
Actinomyces species		0	0	0	3	0	0
Aeromonas caviae		0	0	0	1	0	0
Alcaligenes xylosoxidans	AMIKACIN	0	0	2	2	0	100
	AZTREONAM	0	0	2	2	0	100
	CEFEPIME	0	2	0	2	0	100
	CEFTAZIDIME	2	0	0	2	100	0

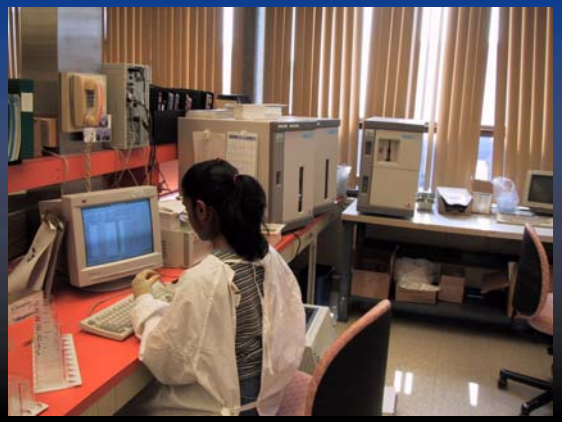
Done Internet

Status of the NHSN eSurveillance Project

- Receiving microbiology detail data from a hospital

  High volume of data generated
  - > 8,000 microbiology lab results per day
  - > 3,000 pharmaceutical orders per day
- Developing Client eSurveillance Messaging Application
- Working with other healthcare facilities to implement specification
- Evaluation/Cleaning of data received
- Developing electronic reporting





Acknowlegement

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