

BioSense Platform Data Flow

Part 2 Data Ingestion into ESSENCE

March 24, 2016

Division of Health Informatics and Surveillance

Center for Surveillance, Epidemiology, and Laboratory Services

Division of Health Informatics and Surveillance



Agenda

- Introductions
- BioSense Platform Update
- Recap: Data Flow into the BioSense Platform Archive
- ESSENCE Overview
- Data Flow into ESSENCE
- ESSENCE Considerations
- Next Steps

BioSense Platform Update

Michael Coletta, MPH, NSSP Program Manager

BioSense Platform Update

1. PLANNING

- ✓ Collaborate to identify critical activities
- ✓ Collaborate to develop requirements (Admin Tool, Master Facility Table)
- ✓ Set up staging environment
- ✓ Set up production environment

2. DEVELOPMENT

- ✓ Create baseline Master Facility Tables
- ✓ **Document data flow**
- Establish data mart
- Develop User Admin Tool
- Research single sign-on solution
- **Adjust ESSENCE settings**
- Develop support documents

3. TRANSITION

- Transition 9 sites per month, beginning summer 2016
- Sunset BioSense Web application
- Develop Facility Admin Tool

RECAP: Data Flow into the BioSense Platform Archive

Roseanne English, BS, Analytic Data Mgmt. Team Lead

BioSense Platform Data Flow Webinars

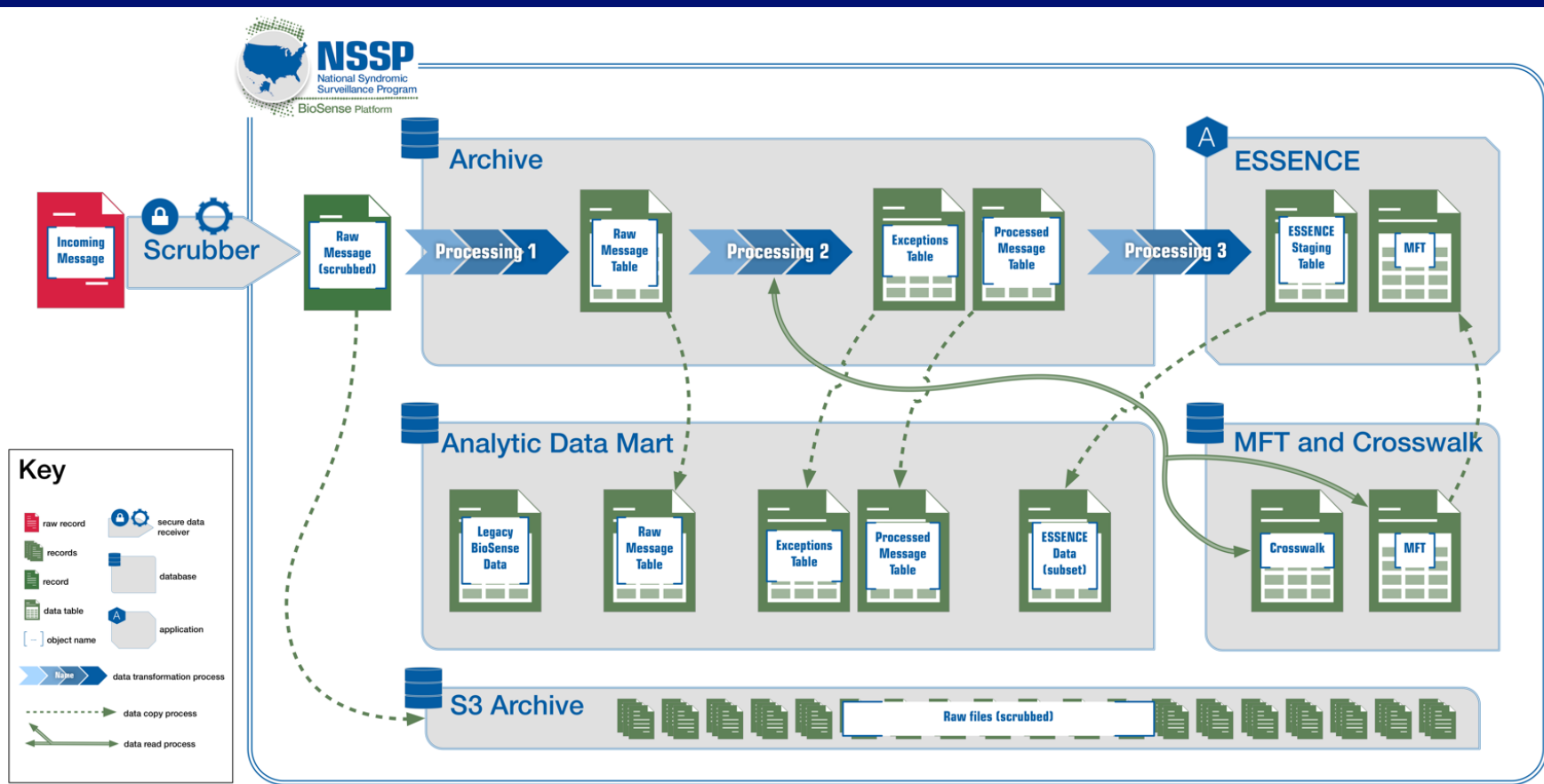
**Part 1. Data Ingestion into the
BioSense Platform**

Part 2. Data Ingestion into ESSENCE

**Part 3. Migrating Legacy
BioSense Data**



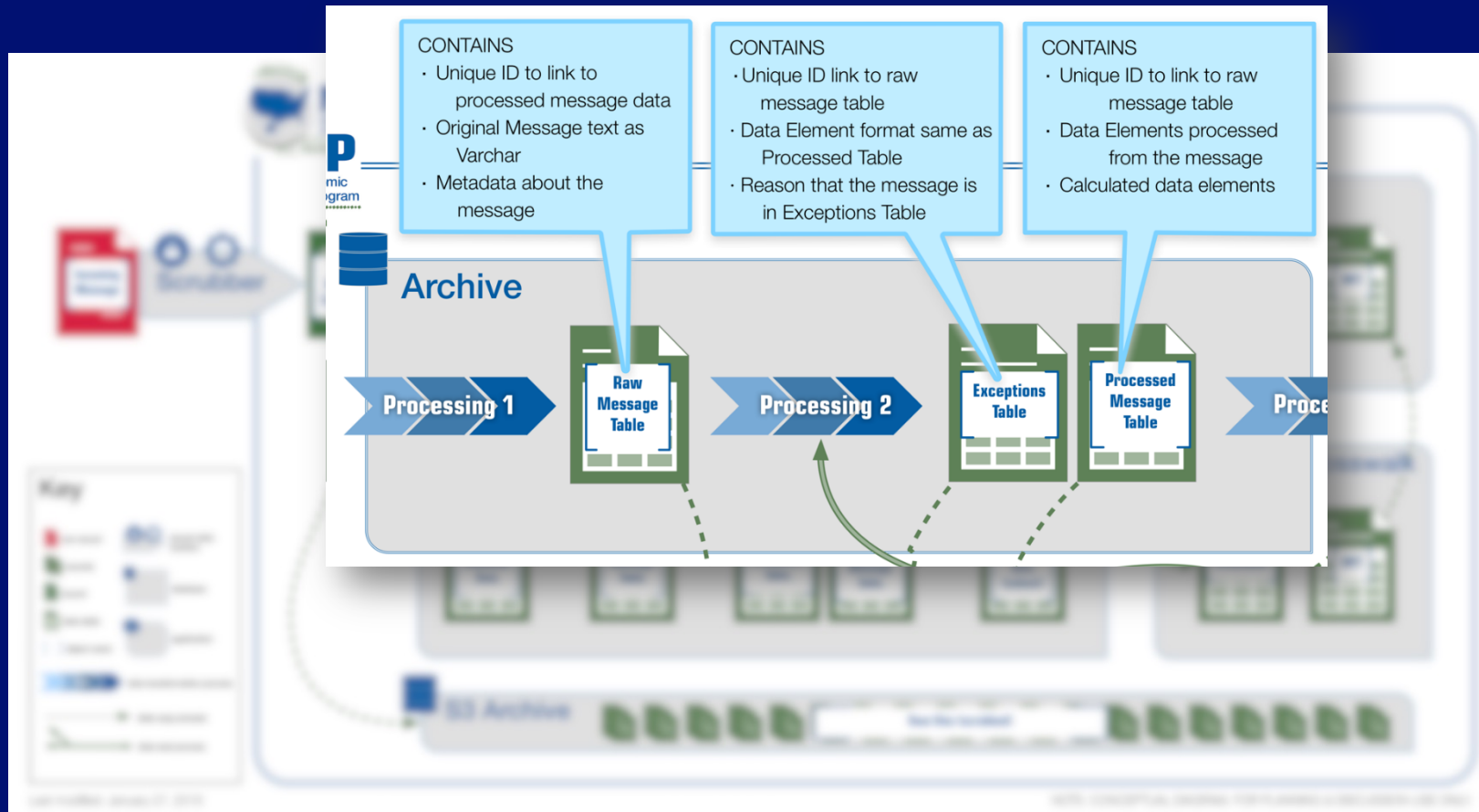
BioSense Platform Data Flow Diagram



Last modified: January 27, 2016

NOTE: CONCEPTUAL DIAGRAM. FOR PLANNING & DISCUSSION USE ONLY.

BioSense Platform Archive



BioSense Platform Archive Modifications

Feedback from BioSense Platform stakeholders helped the NSSP team modify and improve upon the Archive requirements.

- **Repeating data elements will use semicolon (;) separator;** the | separator can cause issues with ESSENCE and data processing
- **NEW Combo Fields (X_Combo)** concatenate codes with their respective descriptions as sent in a message

Diagnosis_Code	Diagnosis_Description	Diagnosis_Combo
488.8;464	Influenza due to novel influenza A;Acute laryngitis and tracheitis	488.8 Influenza due to novel influenza A;464 Acute laryngitis and tracheitis
488;487	;Influenza	488 ;487 Influenza

BioSense Platform Archive Modifications (continued)

- **Calculated Chief Complaint (C_Chief_Complaint)**—now hierarchically defined as the first non-null value from...
 - Chief_Complaint_Text (from TX or CWE data type)
 - Admit_Reason_Description
- **Calculated Patient Age**
 - C_Patient_Age (Available in months if age < 2 years when calculated from birth date and visit date)
 - C_Patient_Age_Years (Normalized to an integer value for all age values and rounded down)

BioSense Platform Archive Modifications (continued)

- **Calculated Visit Date**—now hierarchically defined by selecting the first non-null value from...
 - Admit Date/Time (PV1-44)
 - Earliest date among Discharge Date/Time (PV1.45.1), Procedure Date/Time (PR1.5.1), Patient Death Date/Time (PID.29.1), Recorded Date/Time of Message (EVN.2.1), or Date/Time of Message (MSH.7.1)

- **Removed C_Valid_Visit_Date element**
 - If visit date cannot be calculated (is null) or is set in the future (compared to time of processing), that message will be stored in the Archive Exceptions table

BioSense Platform Archive Modifications (continued)

- **Calculated Patient Class**—no longer restricted to values E, I, and O; set to first non-null value among:
 - **Patient_Class_Code**—reported patient class from message
 - **C_FacType_Patient_Class**—patient class inferred from facility type reported in the message
 - **C_MFT_Patient_Class**—patient class associated with the primary facility from the MFT for the facility ID reported in the message

- **Revised Facility Type mapping to Patient Class**
 - Proposal to map Urgent Care facilities to patient class code of O (rather than previously proposed mapping to E)

BioSense Platform Archive Modifications (continued)

- Unique IDs generated for processing

Initial Name	NEW Name	Processing (updated)
C_Unique_Visit_ID	C_BioSense_ID	C_Visit_Date + C_Facility_ID (<i>includes Site_ID</i>) + C_Unique_Patient_ID
C_Processed_Visit_ID	C_Processed_BioSense_ID	C_Visit_Date + C_Processed_Facility_ID (<i>includes Site_ID and C_Patient_Class</i>) + C_Unique_Patient_ID

Processing clarification: if a patient visits a facility twice on the same day, messages for both interactions will be associated with the same C_BioSense_ID

BioSense Platform Archive Modifications (continued)

- **OBX segment processing**
 - In X_Segment columns tied to coded elements from OBX segments, the entire OBX segment will be stored (not just OBX-5 or OBX-6)

Received Chief Complaint as	Chief_Complaint_Code	Chief_Complaint_Text	Chief_Complaint_Segment	Chief_Complaint_Type
TX	NULL	STOMACH ACHE THAT HAS LASTED 2 DAYS; NAUSEA AND VOMITING; MAYBE A FEVER	OBX 3 TX 8661-1^Chief complaint^LN STOMACH ACHE THAT HAS LASTED 2 DAYS; NAUSEA AND VOMITING; MAYBE A FEVER	TX

BioSense Platform Archive Modifications (continued)

- **Addition of string fields that capture date/numeric type information as a string to enhance processing**
 - Message info is read into a string type field (Str_XXX)
 - String is then converted to datetime or numeric value
 - If string contains info not valid for that data type, the element is null

Str_Birth_Date_Time	Birth_Date_Time
19860501	1986-01-01 00:00:00:000
Yesterday	.
May 1	.
May 1. 1986	1986-01-01 00:00:00:000

BioSense Platform Data Flow Webinars

Part 1. Data Ingestion into the
BioSense Platform

Part 2. Data Ingestion into ESSENCE

Part 3. Migrating Legacy
BioSense Data



ESSENCE Overview

Michael Coletta, MPH, NSSP Program Manager

ESSENCE Features

- Ad hoc queries
- Dashboards
- Interactive maps
- Interactive time series graphs
- Overview time series graphs stratified by key variables
- Time of arrival analyses for clusters
- Table and crosstab builder
- Interactive “pop-up” bar charts
- Self-defined alerts with adjustable statistics (“my alerts”)
- Ability to share queries
- Ability to share dashboards
- Ability to share static or dynamic bookmarks
- Records of interest queries
- Event communication system
- Dynamic report templates

ESSENCE Pilot Feedback

"...highly versatile . . . I can do so many things relevant to workflows I want to adopt when doing investigations."

"...a lot of functionality and customizability."

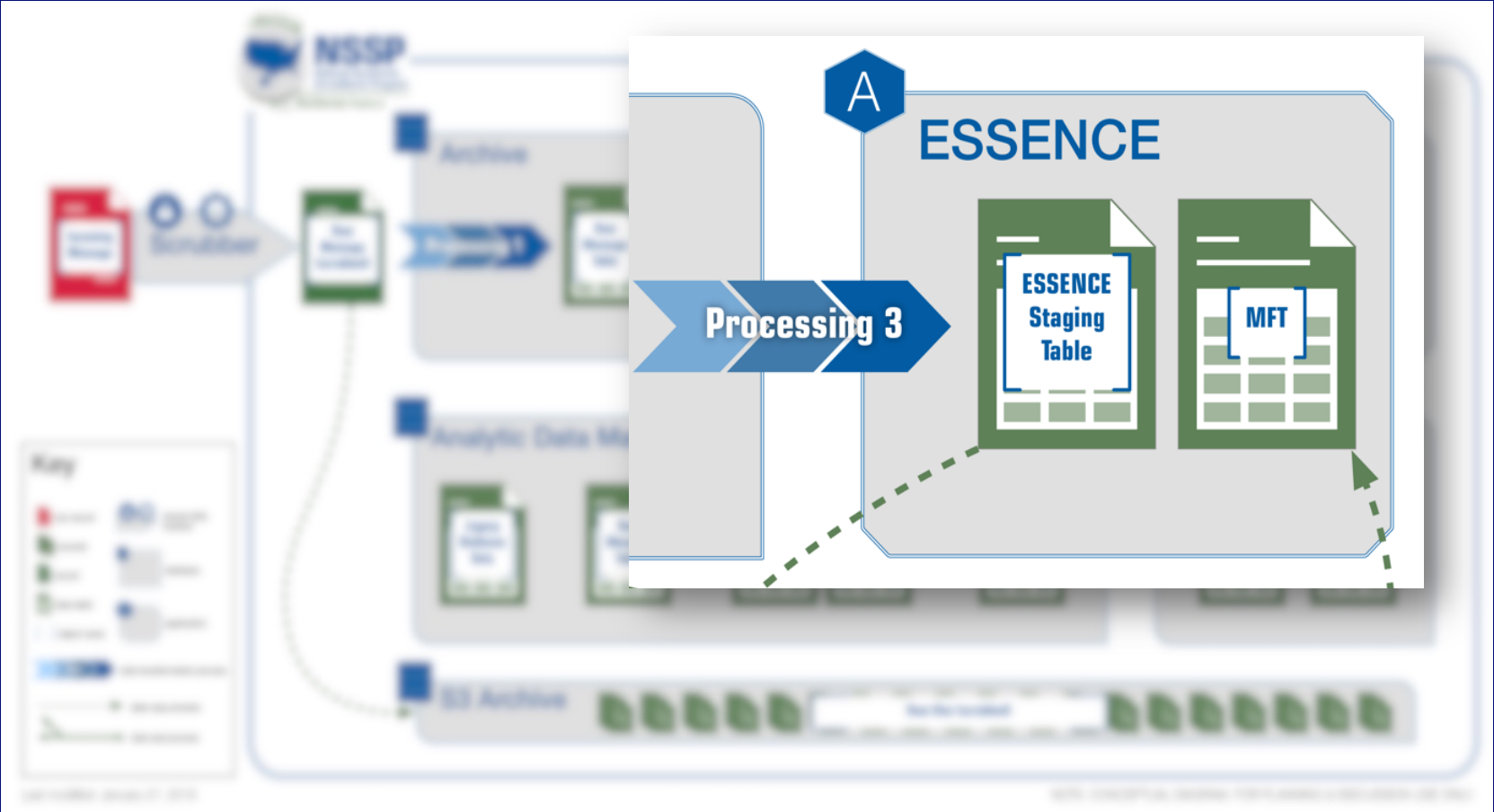
"The combined chief complaint and discharge diagnosis field allows querying on both fields simultaneously."

"I like the options for streamlining my workflow—myESSENCE, myAlerts, and Report Manager."

Data Flow into ESSENCE

Roseanne English, BS, Analytic Data Mgmt. Team Lead

Data Flow into ESSENCE



Sending Data to ESSENCE

Messages in Archive Processed Table will be pushed to ESSENCE

- For mapping documentation, see protected folder “NSSP Doc Review” on ISDS Forum
- Archive Processed and ESSENCE column names are generally the same, with the exception of key fields for ESSENCE processing

Guiding principles for selecting data to send to ESSENCE

- Core elements in PHIN Guide for Syndromic Surveillance
- Elements of analytic importance
- Elements required to support ESSENCE processing
- Timestamp information

Where possible, column names in the Archive and in ESSENCE are the same

Archive Processed Column	ESSENCE Column
C_Facility_ID	Hospital
C_Chief_Complaint	ChiefcomplaintOrig
Diagnosis_Code	DischargeDiagnosis
Discharge_Disposition_Code	DischargeDisposition

Data Flow within ESSENCE



Ingestion
ER_Import_Staging
ER_Base

Detection
(aberration detection
algorithms)

Web
(e.g.,
Cache ER
Base)

ESSENCE Ingestion Processing – Staging Table to Base Table

- **ESSENCE application processes data to...**
 - Collapse messages into a single “visit” (using same algorithm to identify a visit as the Archive column C_BioSense_ID)
 - Associate visits with specified syndromes and sub-syndromes via Chief Complaint binning
 - Support Web-based queries
- **For each visit, ESSENCE populates each column with info present in last message processed for that visit**
 - ESSENCE enhancement: History fields (four elements now have companion history fields that store info across all messages that constitute a single visit)
 - Per community feedback, additional history fields may be added

ESSENCE Ingestion Processing – Staging Table to Base Table (continued)

ER_Import_Staging (ESSENCE Staging Table)

MessageDateTime	C_Visit_Date_Time	C_Unique_Patient_ID	Hospital (C_Facility_ID)	Sex	Age
20160301 08:30:00:000	20160229 02:30:00:000	A12B3	001FACILITYID	F	.
20160301 08:40:00:000	20160229 02:30:00:000	A12B3	001FACILITYID	.	40
20160301 09:30:00:000	20160229 01:30:00:000	123456	001FACILITYID	M	22

Collapse to
"Patient Event"



ER_Base (ESSENCE Base Table)

ESSENCEID	MessageDateTime	C_Visit_Date_Time	C_Unique_Patient_ID	Hospital (C_Facility_ID)	Sex	Age
20160229001FACILITYIDA12B3	20160301 08:40:00:000	20160229 02:30:00:000	A12B3	001FACILITYID	.	40
20160229001FACILITYID123456	20160301 09:30:00:000	20160229 01:30:00:000	123456	001FACILITYID	M	22

History Field: Patient Class

- **Two Patient Class variables with companion history fields**
 - **PatientClass**—maps to the patient class reported in the message (Patient_Class_Code – PV1-2 – in the Archive)
 - **C_Patient_Class**—calculated patient class from the Archive
- **Last reported value from message**
- **De-duplicated, alphabetical list of all values reported throughout a visit**
- **Ordered list of all reported values throughout a visit**
- **Timestamp to document when fields were last updated**

Example: Patient Class History Field

ER Import StagingTable	
Message Order	PatientClass
1	E
2	I
3	E



ER Base Table		
PatientClass	PatientClass_H1	PatientClass_H2
E	E	E E

How does it work? Check out "PatientClassHistoryExample_Tool" in protected NSSP Doc Review folder on ISDS Forum.

History Field: Chief Complaint

- First reported, non-null value for Chief Complaint
- De-duplicated, ordered list of all Chief Complaint values sent across messages for a single visit
- Timestamp to document when fields were last updated

Chief Complaint binning will run against values from a column named ChiefComplaintParsed, which contains parsed information from ChiefComplaintOrig.

C_Chief_Complaint from the Archive populates ChiefComplaintOrig.

Example: Chief Complaint History Field

ER Import Staging Table	
Message Number	ChiefComplaintOrig
1	My Original Chief Complaint
2	Brief Chief Complaint
3	



ER Base Table	
ChiefComplaintOrig	ChiefComplaint_H1
My Original Chief Complaint	My Original Chief Complaint Brief Chief Complaint

History Field: Discharge Disposition

- Last reported, non-null value for Discharge Disposition
- De-duplicated, ordered list of all Discharge Disposition values sent across messages for a single visit
- Timestamp to document the last time the fields were updated

DischargeDisposition is populated from Discharge_Disposition (PV1-36) in the Archive.

Example: Discharge Disposition History Field

ER Import Staging Table	
Message Number	DischargeDisposition
1	
2	My First Discharge Disposition



ER Base Table	
DischargeDisposition	DischargeDisposition_H1
My First Discharge Disposition	My First Discharge Disposition

History Field: Discharge Diagnosis

- Last reported, non-null value for Discharge Diagnosis
- De-duplicated, ordered list of all Discharge Diagnosis values sent across messages for a single visit
- Timestamp to document the last time the fields were updated

*DischargeDiagnosis is populated from
Diagnosis_Code (DG1) in the Archive.*

*DischargeDiagnosis is also appended to
ChiefComplaintParsed to create an analysis
variable "CCDD" within ESSENCE.*

History Field: Discharge Diagnosis

ER Import Staging Table	
Message Number	DischargeDiagnosis
1	123;987
2	999;123
3	



ER Base Table	
DischargeDiagnosis	DischargeDiagnosis_H1
999;123	123;987 999;123

ESSENCE Query Tool

Understanding the data that is available and how it is processed may influence the construction of queries and customizations to the Query Tool

The screenshot displays the 'Query Wizard' interface with the following configuration:

- Datasource:** ER Data by Patient Location
- Time Resolution:** Daily
- Detector:** Regression/EWMA 1.2
- As Percent Query:** No Percentage Query
- Start Date:** 11Dec15
- End Date:** 10Mar16

The interface is divided into two main sections:

- Available Query Fields:** A tree view showing the following structure:
 - ER Data by Patient Location
 - Geography System
 - Region
 - DHHS Region
 - State
 - Zipcode
 - Facility
 - Site
 - Medical Grouping System
 - ChiefComplaintSubSyndromes
 - Syndrome
 - ChiefComplaints
 - Age Group

- Selected Query Fields:** A list of fields currently selected for the query:
- Geography System** (with a right arrow icon):
 - Region
- Medical Grouping System** (with a right arrow icon):
 - ESSENCESSyndromes

Initial ESSENCE Settings

Shayne Gallaway, PhD, MPH, Health Scientist

Introduction to ESSENCE Settings

- **ESSENCE settings allow user configurations:**
 - Customizable query capabilities
 - Syndrome-detection algorithms
 - Regional syndromes viewable by region, hospital, spatial, and date/time
 - *And many more!*
- **Initial considerations for BioSense Platform:**
 - Define the minimum data set viewable at national/state levels (“National View”)
 - Define available data sources
 - Determine alert settings and related features

National View

- The National View will be a minimum data set accessible to all users of the BioSense Platform's ESSENCE application
- What should be included in the National View?

Some agreement* achieved	To be discussed
<ul style="list-style-type: none">• Encounter date• Patient age, in 5-year age groups• Patient gender• HHS Regions (10)• Syndrome• Sub-syndrome• Disposition	<ul style="list-style-type: none">• Patient class• Time of arrival• Others?

* Previously discussed with BioSense Governance Group (Summer 2015)

National View: Chief Complaint and Diagnosis Code

■ Importance

- Chief Complaint and Diagnosis Code are used to develop regional and national syndromic definitions

■ Challenge

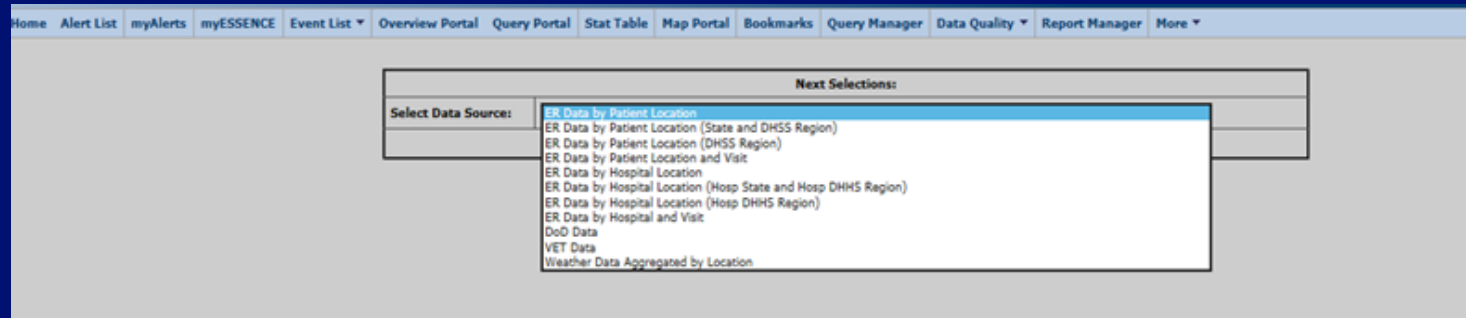
- Both fields may contribute to identifying information (alone or in combination with other data)

■ Proposed solution:

- Segregate Chief Complaint and Diagnosis Code to enable querying details
- Results would not return other viewable details
- Users can create and modify queries to capture syndromic definitions of interest

ESSENCE Data Sources

- **Out-of-the-box data sources may need modification or clarification to support BioSense Platform needs**
 - ER Data by Patient Location (All, HHS Region, State and HHS Region)
 - ER Data by Patient Location and Visit
 - ER Data by Hospital Location (All, Hosp HHS Region, Hosp State and Hosp HHS Region)
 - ER Data by Hospital and Visit



ESSENCE Alert Settings

- **Determine data source for alerts**
 - Emergency Department?
 - Inpatient?
 - Urgent Care?
- **Know what is and is not included in data source**
- **Identify related event notifications**
- **Determine standard procedures for the Reports Manager**

ESSENCE Settings – Additional Topics

- Identification of queryable fields
- Query overview parameters
- Viewable details for selected records
- Others

Want to help?

Users of all experience levels can contribute to ESSENCE settings and tool development

Questions? We appreciate your input.

Michael A. Coletta, MPH
Manager, National Syndromic Surveillance Program
CDC/CSELS/DHIS
mcoletta@cdc.gov

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30329-4027

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

Visit: <http://www.cdc.gov> | Contact CDC at: 1-800-CDC-INFO or <http://www.cdc.gov/info>

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Center for Surveillance, Epidemiology, and Laboratory Services

Division of Health Informatics and Surveillance

