Objectives

- By the end of the presentation, participants will be able to:
  - Define data automation in relation to healthcare quality surveillance
  - Identify current NHSN surveillance automation
  - Outline NHSN’s plans for automating pandemic surveillance
  - Identify future NHSN automated healthcare measures

Data Automation - Definition

A technique, method, or system for enabling computers or other machines to operate or control a process that eliminates or reduces the need for human intervention.

Automated healthcare quality surveillance: use of computers to collect and exchange healthcare data for purposes of (1) identifying opportunities for improvement in healthcare processes or outcomes or (2) measuring the success of healthcare improvement initiatives.
Healthcare-associated Infection Reporting in NHSN

Current state
- 37,381 Active NHSN facilities (4/21/2021)
- Manual or IC software data collection and IP verification data feed to NHSN
  - Manually, or
  - CSV import, or
  - CDA Import
- NHSN DIRECT CDA Automated send

Automated Surveillance Requirements and Challenges
Harnessing data that is universally...

- Recognized
- Objective
- Consistent
- Electronically accessible

To develop healthcare surveillance definitions and quality metrics which can be tested, endorsed and used by healthcare facilities to optimize patient outcomes.

Examples of types of data:
- Laboratory results
- Prescribed medications
- Isolation orders

Big Data and Big Data Analytic Techniques are enormous opportunities for advances in healthcare surveillance and quality measurement.

Data Lake
A large, open information space that can accommodate differently formatted data elements. For example:
- Diagnoses
- Problem lists and progress notes
- Laboratory results
- Medication administrations
- Patient-generated health data

Big Data and Predictive Analytics (BDPA)
Fusing different data types on a massive scale and applying predictive and real-time analysis capabilities.

Efforts to Introduce, Revise, and Extend HAI and AUR Measures Must Contend with the Limitations of Healthcare IT

Hospitals and Health Networks, October 2012; pages 24-26, 29-30


Mostly EHRs Have Served Frontline Practitioners Poorly, But EHRs Do Gather Patient Data in One Place and Have Led to Some Notable Benefits

What the EHR has done is help reduce medication errors; it is a wonderful gathering place for laboratory and imaging information; the notes are always legible. But... our daily progress notes have become bloated cut and paste monsters that are inaccurate and hard to wade through... so much of the EHR, but particularly the physical exam it encodes, is a marvel of fiction.

New York Times Magazine, May 20, 2018; pages 57-60
Advances in Healthcare IT Facilitate Reuse of Clinical and Laboratory Data for NHSN's Surveillance Purposes

- Medication administrations: From peel away labels to bar code scans
- Laboratory results: From paper printouts to electronic laboratory reporting
- Medical records and databases: From paper-based to electronic systems

Current NHSN Data Automation

NHSN Antimicrobial Use Option of the Antibiotic Use and Resistance Module
- Antimicrobial Use Option
  - Summary-level data
  - Numerator:
    - Antimicrobial (specific) Days – monthly
      - Sub-stratified routes
      - Totals
    - Denominators-monthly for location and facility
      - Days present (unique for AU)
      - Admissions
Clinical Document Architecture (CDA)
- Health Level 7 (HL7) standard
- Provides facilities with standardized way to package & upload data
  - HAI, AU, AR, Hemovigilance, Dialysis
- CDA ≠ CSV(Excel)

Clinical Document Architecture (CDA) cont.
- Users must have administrator or customized rights to upload CDAs
- Each CDA file contains a single event or summary for one facility
- CDAs must be uploaded in a zip file
  - Can contain one or many CDA files
  - Less than 2 MB or contain less than 1,000 files

NHSN’s Antimicrobial Use Data Supply Chain
- Extract, transform and load AU data by means of a vendor or homegrown IT solution
  - Numerator: Antimicrobial days aggregated monthly by agent and patient care location
  - Denominator: Days present and admissions per month
- NHSN Servers
  - Local AU data access via NHSN’s web interface
  - AU report in standard electronic format
  - Analysis, visualization, and reporting AU data
Delivering AU Data to NHSN – Automation is an Option

- Clinical Document Architecture (CDA)
  - For some facilities = manual CDA upload
  - For some facilities = automatic CDA upload via NHSN DIRECT

2,536 facilities have reported at least one month of data as of 4/14/2021

NHSN Plans for Automating Pandemic Surveillance

A Slimmed Down and Automated Approach

- Daily measures that could be automated to be sent to NHSN

- Line level data that would be pulled from the EMR and provide supplemental information about the individual, their medical history, their location, etc.
COVID-19 Measure Reports and Supplementary Data
- Draft Examples -

<table>
<thead>
<tr>
<th>Daily Measure Reports</th>
<th>Supplementary, Line-Level Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Laboratory Confirmed COVID-19 Inpatients</td>
<td>- Age</td>
</tr>
<tr>
<td>- COVID-19 Inpatients Admitted From Nursing Homes</td>
<td>- Gender</td>
</tr>
<tr>
<td>- Mechanically Ventilated COVID-19 Inpatients</td>
<td>- Race/Ethnicity</td>
</tr>
<tr>
<td>- COVID-19 Inpatients in Intensive Care Units</td>
<td>- Hospital Admission Date</td>
</tr>
<tr>
<td>- COVID-19 Inpatients in Isolation Status</td>
<td>- Ward or Intensive Care Unit Location</td>
</tr>
<tr>
<td>All COVID-19 Inpatients</td>
<td>- SARS-CoV-2 Vaccination Status</td>
</tr>
<tr>
<td>All COVID-19 Inpatients</td>
<td>- Mechanical Ventilation Status</td>
</tr>
<tr>
<td>All COVID-19 Inpatients</td>
<td>- Co-morbidities</td>
</tr>
<tr>
<td>All COVID-19 Inpatients</td>
<td>- Complications</td>
</tr>
<tr>
<td>All COVID-19 Inpatients</td>
<td>- Hospital Discharge Date</td>
</tr>
<tr>
<td>All COVID-19 Inpatients</td>
<td>- Hospital Discharge Disposition</td>
</tr>
</tbody>
</table>

The Future is Nigh- Other NHSN Automation To Come

21st Century Cures Act Provides an Important Impetus for Data Automation and Interoperable Healthcare IT Systems

- Primarily designed to accelerate development and access to new drugs
- Title IV includes provisions aimed at achieving widespread interoperability among health IT systems
- Requires health IT suppliers to make “all data elements” of a patient’s record available “without special effort” via Application Programming Interfaces (APIs)
- Federal rules require use of the Health Level Seven (HL7) Fast Healthcare Interoperability Resources (FHIR) standard for data elements made accessible via APIs

Signed into law on December 13, 2016
Health Level Seven's (HL7’s) FHIR Standard

F – Fast (to design and implement)
H – Healthcare
I – Interoperability
R – Resources (core healthcare information elements)

• Focus is on easy implementation
• Standardizes core healthcare data elements (known as FHIR resources), such as patients, admissions, diagnostic reports, and medications
• Combines features of prior HL7 versions, such as data format standards, with web service technologies, namely APIs, that have gained wide, cross-industry use

EHR Systems and Data Automation for NHSN Surveillance: Following the FHIR Path

NHSN Plans to Use the FHIR Standard for Automating Hospital HAI and AUR Data Collection and Reporting

*Patient-level data that can be culled using automated processes and included in numerator, denominator, and line-level reports.
NHSN’s Current CLABSI Criteria: A Legacy of Surveillance Specifications Introduced in the 1980s

- **Microbiologic confirmation** – A bloodstream infection that is laboratory confirmed (i.e., positive blood culture results)
- **Timing** – Infection occurs on or after the 3rd calendar day of admission to a hospital inpatient location
- **Other infection source ruled out** – Not secondary to an infection at another site, such as a urinary tract infection or pneumonia
- **Associated with central line use** – A central line or umbilical catheter was in place for more than 2 calendar days and on the date of the infection event or the day before

AGAIN.....Harnessing data that is universally....

- Recognized
- Objective
- Consistent
- Electronically accessible

To develop healthcare surveillance definitions and quality metrics which can be tested, endorsed and used by healthcare facilities to optimize patient outcomes.

Examples of types of data:
- **Laboratory**
- **Treatment**

NHSN’s Near-Term Plans To Automate Use of Microbiology Results and Antimicrobial Use Data for HAI Surveillance and Quality Measures

- Hospital onset bacteremia
- *Clostridioides difficile* (C. diff.) identified from a diagnostic laboratory test and concurrent antimicrobial treatment
- Late Onset Sepsis and Meningitis in Neonates

Note: Hospital and patient-care location data reported to NHSN are available for risk adjustment now, with collection and use of patient-level data envisioned for future use.
NHSN Data Automation Priorities and Plans

- **Priorities**
  - Develop and deploy machine executable processes for data collection and reporting by healthcare facilities that are more timely, accurate, and scalable than manual methods
  - Focus first on pandemic reporting, then healthcare-associated infection surveillance
  - Lead the way with standards-based, vendor-neutral interoperability solutions and guidance

- **Plans**
  - Begin with automated, machine-machine (M2M) reporting that enable hands-free data transmission of simple files from healthcare facilities or intermediaries to NHSN
  - Advance to M2M reporting that use more sophisticated, electronic messages based on the Health Level Seven (HL7) Fast Healthcare Interoperability Resources (FHIR) standard
  - Add automated case finding using a decision support engine embedded in the electronic case reporting infrastructure and automate assembly of FHIR-based summary measures for cases and patient-level data for M2M transmissions to NHSN in standard bundles.
Continuing Education Credit

- CEU: The Centers for Disease Control and Prevention is authorized by IACET to offer 0.1 CEUs for this program.
- In order to receive continuing education (CE) for course # WC4480, NHSN Electronic Reporting Involving EMR Integration please visit TCEO, https://www.cdc.gov/getCE, and follow these 9 Simple Steps before 06/19/2021.
  - The course access code is NERIEI21 (to access the post-assessment)
  - Attend or listen to the presentation
  - Complete the Evaluation at www.cdc.gov/GetCE
  - Pass the posttest at 75% at www.cdc.gov/GetCE