AUDACIOUS INQUIRY

BOLD SOLUTIONS FOR CONNECTED HEALTHCARE

Situational Awareness for Novel Epidemic Response

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Background

- Hospitals and public health authorities have limited visibility on health care capacity, supply, and available staffing across facilities.
- Complicates patient transfers, evacuations, and the ability to absorb patient surge while maintaining essential routine care services.
- Responsibility to load balance falls on the individual care facility rather than a trusted centralized entity.
- Technical infrastructure is fragmented and often hospital/healthcare system/locality specific.
- There is no national or federal standard for exchange of health care situational awareness information during disasters and PHEs.

Situational Awareness in Disasters and Public Health Emergencies: September 11, 2001

- "Communications and coordination were deficient between EMS control at the incident site and area hospitals receiving injured victims. The coordination difficulties were not simple equipment failures. They represent flaws in the system present on September 11. Regional hospital disaster plans **no longer require a Clearinghouse Hospital or other designated communications focal point** for the dissemination of patient disposition and treatment information."

Arlington County After Action Report on the Response to the September 11 Terrorist Attack on the Pentagon. http://www.policefoundation.org/wp-content/uploads/2018/07/pentagonafteractionreport.pdf

Situational Awareness in Disasters and Public Health Emergencies: Hurricane Katrina

- "Attention must be devoted to the possibility that hospitals will need to evacuate their charges... External coordination is essential, as solutions to hospitals' **problems cross agency lines and require assets for which there will be competing demands**."
- "Suitable destinations must be identified for patients who are to be evacuated, particularly those who have critical care needs. Before Katrina struck, **some hospitals could not find another hospital to accept their patients**... At least one hospital stopped evacuating its patients after learning that they were being transported to a triage location with little capacity for patient care."

The Urban Institute, 2006. https://www.urban.org/sites/default/files/publication/50896/411348-Hospitals-in-Hurricane-Katrina.PDF

Situational Awareness in Disasters and Public Health Emergencies: H1N1

- "The current novel H1N1 epidemic has provided a real-life test of our situational awareness capabilities. One thing that we certainly learned from this outbreak is that situational awareness is critically important—it **drives policy decisions**."
- "...states and the federal government need a process to know what is going on at the ground level in hospitals and other healthcare facilities. They need this information to **know how best to deploy their limited resources** and to identify critical choke points that they may be able to alleviate."

Toner, 2009. https://europepmc.org/books/n/nap12798/nap12798.app6/?extid=20464769&src=med

Situational Awareness in Disasters and Public Health Emergencies

- "For event management purposes, it is **important to have data on health care utilization**, in addition to illness data, to more fully manage preparedness activities and health communications."
- "Information systems used by individual states and health departments **are highly variable in scope and operation and not necessarily compatible**. Current challenges include updating systems to be interoperable without reinventing the wheel or draining resources, and **describing a common language and parsing system** for gathering and reporting data from case records."
- "Limitations include the **lack of human resources** to analyze and aggregate epidemiologically-useful information and manage the technical aspects of the system; **lack of technological infrastructure** to accommodate electronic transmission of data; and **inconsistent standards for health information messaging** and system capabilities across jurisdictions."

UNC, 2013. https://nciph.sph.unc.edu/docs/BiosurvReport_092013.pdf

Situational Awareness in Disasters and Public Health Emergencies: Hurricane Harvey

- At least 10 hospitals experienced a 600% ED visit surge from evacuees, two of which experienced >1,000% surge.
- Disaster preparedness efforts should be **coordinated across geographic boundaries to account for population mobility** during an event.
- **Hospitals within 1 to 4 hours driving distance** from major disasters should prepare in advance of the storm for a medical surge.

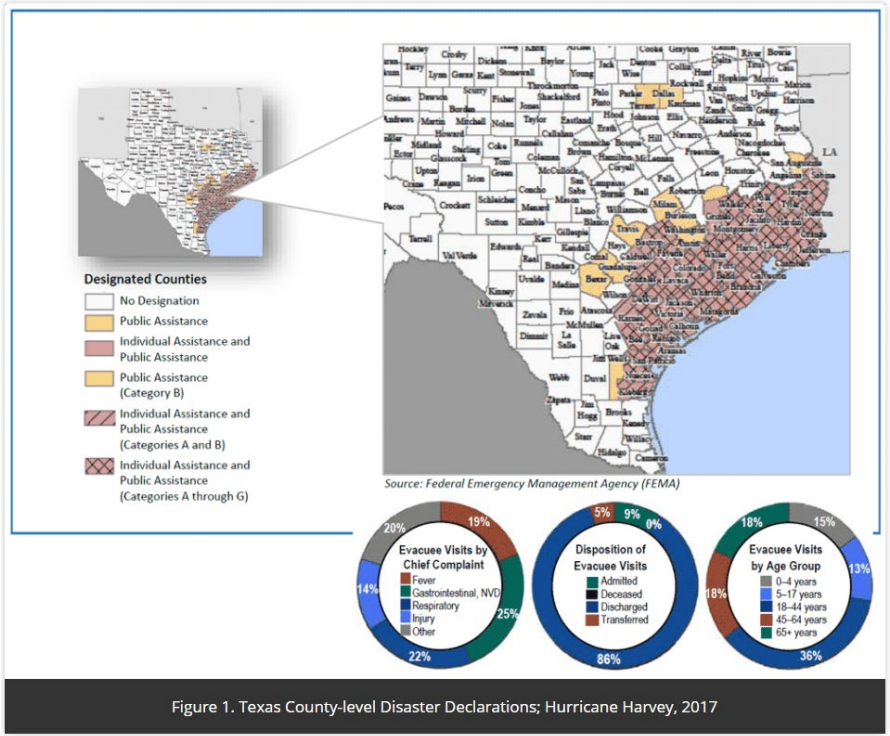


Figure 1. Texas County-level Disaster Declarations; Hurricane Harvey, 2017

CDC, 2017. https://www.cdc.gov/nssp/success-stories/TX-Hurricane-Harvey.html

Enabling Legislation

- "The Secretary [of HHS], in collaboration with State, local, and tribal public health officials, shall establish a near real-time electronic nationwide public health situational awareness capability through an interoperable network of systems to share data and information to enhance early detection of rapid response to, and management of, potentially catastrophic infectious disease outbreaks and other public health emergencies that originate domestically or abroad."

- Pandemic All Hazards Preparedness Act (PAHPA, 2006). https://www.govinfo.gov/content/pkg/PLAW-109publ417/pdf/PLAW-109publ417.pdf
- Pandemic All Hazards Preparedness Reauthorization Act of 2013. https://www.govinfo.gov/content/pkg/PLAW-113publ5/pdf/PLAW-113publ5.pdf
- Pandemic All Hazards Preparedness and Advancing Innovation Act of 2019. https://www.congress.gov/116/bills/s1379/BILLS-116s1379enr.pdf

Progress

- Government Accountability Office Reports of 2010 and 2017
- *"HHS developed an implementation plan ... However, the actions identified in the plan did not address all of the required activities, such as defining data elements and standards. Until the department addresses all required activities, it will lack an effective tool for ensuring that public health situational awareness network capabilities have been established in accordance with all of the requirements defined by the law."*

- **Public Health Information Technology: Additional Strategic Planning Needed to Guide HHS's Efforts to Establish Electronic Situational Awareness Capabilities**

https://www.gao.gov/products/gao-11-99

- **HHS Has Made Little Progress toward Implementing Enhanced Situational Awareness Network Capabilities**

https://www.gao.gov/assets/gao-17-377.pdf

Hospital Preparedness Program Requirements: 2017-2022

Given the need to establish a common operating picture for effective response, HPP and PHEP awardees and HCCs must provide situational awareness data, including data on bed availability, to ASPR and CDC during emergency response operations and at other times, as requested.

HCC requirement:

- Within the first 90 days of each budget period, all HCCs must provide ASPR an updated pre-event specific EEI template. ASPR will provide recipients with a list of all required post-event and special-event EEIs for incorporation into state, local, and HCC reporting systems.

HCC Requirement:

- The HCC and its members must, at a minimum, define and integrate into their response plans procedures for sharing essential elements of information (EEIs). This includes but is not limited to:
  - The current operational status of facilities
  - Elements of electronic systems (HCC-level requirement)
  - Resource needs and availability.

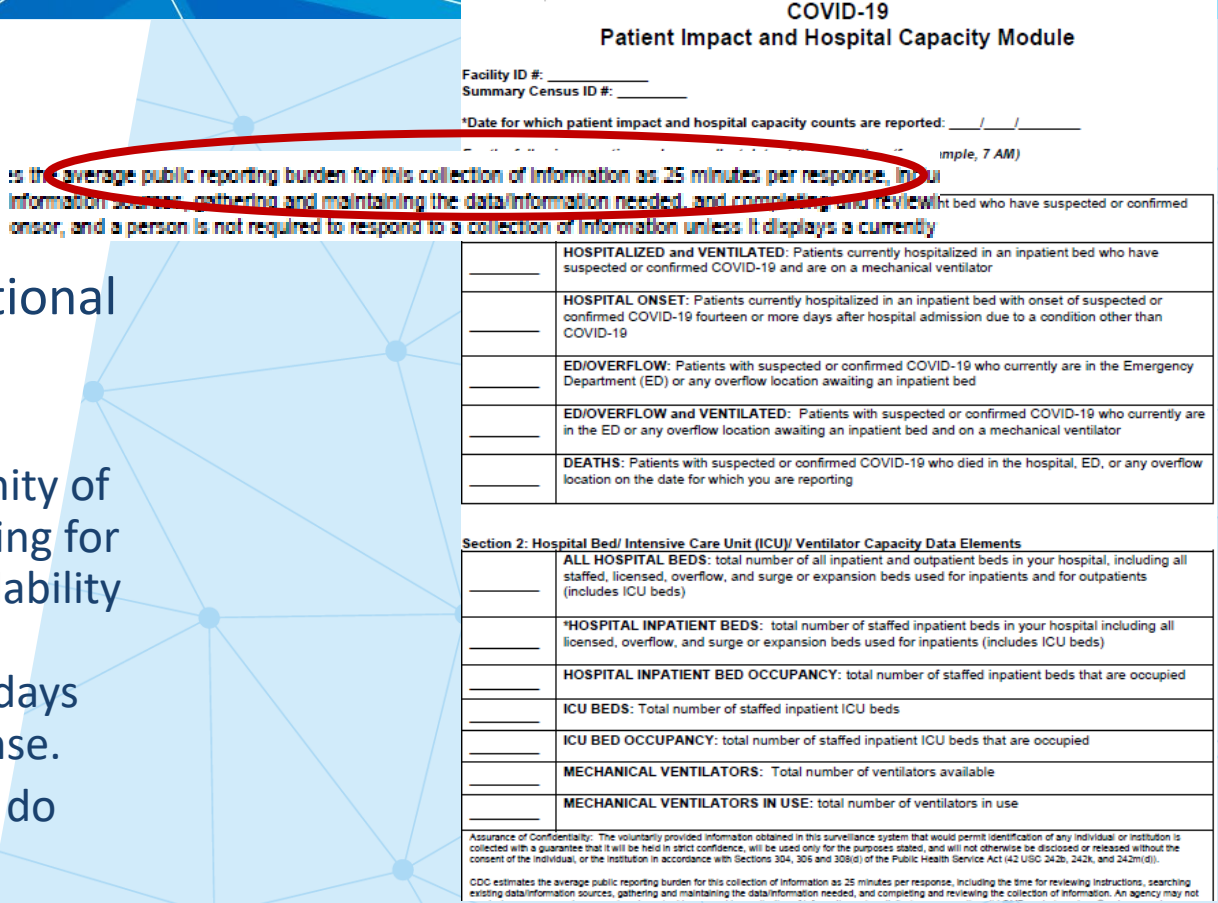
https://www.cdc.gov/cpr/readiness/00_docs/PHEP-Funding-CDC-RFA-TP17-1701.pdf

COVID-19

- In March of 2020, learned that ADT networks were being considered as a mechanism for national health care situational awareness
- Several years prior Ai had written an analysis, commissioned by ASPR, indicating that FHIR may be a superior methodology
- Began the work of collaborating with industry partners as The SANER Project

What is the SANER Project?

- SANER stands for Situational Awareness for Novel Epidemic Response
  - It started with the insanity of needing manual reporting for bed and ventilator availability that hospital staff were required to do in early days of the COVID-19 response.
  - With FHIR APIs, we can do better.



COVID-19
Patient Impact and Hospital Capacity Module

Facility ID #: _____
Summary Census ID #: _____

*Date for which patient impact and hospital capacity counts are reported: ____/____/_____

...mple, 7 AM)

...s the average public reporting burden for this collection of information as 25 minutes per response, inclu... information sources, gathering and maintaining the data/information needed, and completing and reviewi... onsor, and a person is not required to respond to a collection of information unless it displays a currently

...ht bed who have suspected or confirmed

_____	**HOSPITALIZED and VENTILATED**: Patients currently hospitalized in an inpatient bed who have suspected or confirmed COVID-19 and are on a mechanical ventilator
_____	**HOSPITAL ONSET**: Patients currently hospitalized in an inpatient bed with onset of suspected or confirmed COVID-19 fourteen or more days after hospital admission due to a condition other than COVID-19
_____	**ED/OVERFLOW**: Patients with suspected or confirmed COVID-19 who currently are in the Emergency Department (ED) or any overflow location awaiting an inpatient bed
_____	**ED/OVERFLOW and VENTILATED**: Patients with suspected or confirmed COVID-19 who currently are in the ED or any overflow location awaiting an inpatient bed and on a mechanical ventilator
_____	**DEATHS**: Patients with suspected or confirmed COVID-19 who died in the hospital, ED, or any overflow location on the date for which you are reporting

Section 2: Hospital Bed/ Intensive Care Unit (ICU)/ Ventilator Capacity Data Elements

_____	**ALL HOSPITAL BEDS**: total number of all inpatient and outpatient beds in your hospital, including all staffed, licensed, overflow, and surge or expansion beds used for inpatients and for outpatients (includes ICU beds)
_____	***HOSPITAL INPATIENT BEDS**: total number of staffed inpatient beds in your hospital including all licensed, overflow, and surge or expansion beds used for inpatients (includes ICU beds)
_____	**HOSPITAL INPATIENT BED OCCUPANCY**: total number of staffed inpatient beds that are occupied
_____	**ICU BEDS**: Total number of staffed inpatient ICU beds
_____	**ICU BED OCCUPANCY**: total number of staffed inpatient ICU beds that are occupied
_____	**MECHANICAL VENTILATORS**: Total number of ventilators available
_____	**MECHANICAL VENTILATORS IN USE**: total number of ventilators in use

Assurance of Confidentiality: The voluntarily provided information obtained in this surveillance system that would permit identification of any individual or institution is collected with a guarantee that it will be held in strict confidence, will be used only for the purposes stated, and will not otherwise be disclosed or released without the consent of the individual, or the institution in accordance with Sections 304, 306 and 308(d) of the Public Health Service Act (42 USC 242b, 242k, and 242m(d)).

CDC estimates the average public reporting burden for this collection of information as 25 minutes per response, including the time for reviewing instructions, searching existing data/information sources, gathering and maintaining the data/information needed, and completing and reviewing the collection of information. An agency may not

What is Situational Awareness?

- Situational Awareness and Essential Elements of Information are terms of art in Emergency Response
  - Communication of “Essential Elements of Information” or EEI
    - “Strategic EEI attributes are those that are required for the purposes of shared situational awareness, monitoring, and coordination support at regional or national levels.”[1]
  - EEIs are Broadly defined in Emergency Response field for
    - Transportation (Air, Water, Rail, Roads)
    - Infrastructure (Power, Water, Fuel)
    - Communications
    - Affected Populations
    - Shelter
    - Command and Control
    - Healthcare
  - Typically under-specified in the Healthcare context
    - e.g., Operational Status and Location of Hospitals

[1] Essential Elements of Information Publication Guidance, National Information Sharing Consortium, 2015, https://www.nisconsortium.org/portal/resources/bin/NISC_EEI_Publication_1426695387.pdf

Standards History

- ANSI/HITSP 2006-2009
  - Emergency Responder Use Case
  - C47 Resource Utilization Component
  - OASIS Open Emergency Data Exchange Language (EDXL)
  - OASIS Open Hospital Availability Exchange (HAVE)
- AHRQ/ASPR 2005-2016
  - National Hospital Available Beds for Emergencies and Disasters (HAvBED)
  - Required by Hospital Preparedness Program (HPP)
- OASIS Open/HL7 2019
  - HAVE 2.0

COVID-19 Challenges

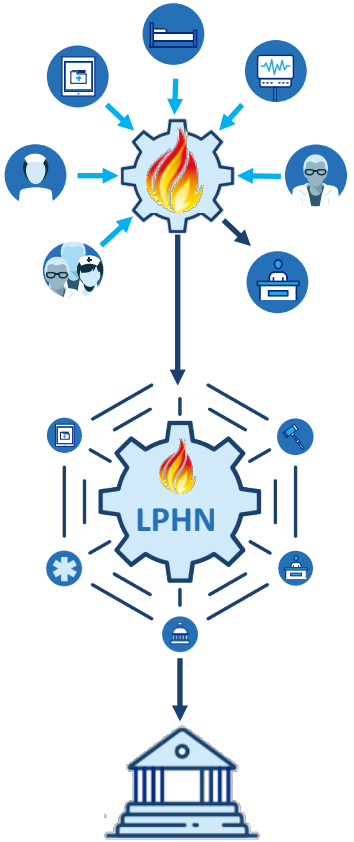
- No longer just Beds but also:
  - Ventilators and related equipment
  - Deaths
  - Hospital Acquired Patients
  - COVID vs. Non-COVID patients
  - Lab Testing Results
  - Staffing
  - Supplies
- Rapid rollout and change:
  - Multiple modules rolled out over 3 month period
  - Refinements needed due to speed of rollout
- National scale

Essential Elements of Information are Measurements

- Capacity / Utilization
  - What do you have? How much is used?
- Event Counting
  - How many times did this happen today? Cumulatively over time?
- Queue Lengths
  - How many are waiting for Service?
- Service Time
  - How long are they waiting?
- Categorical
  - How many are in what status?

How does SANER communicate EEIs?

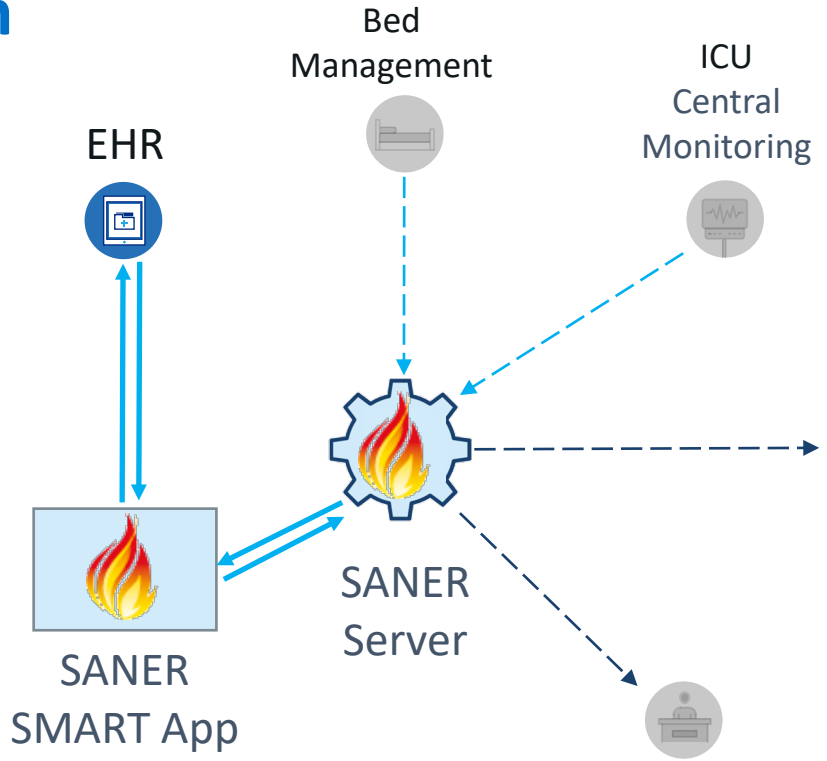
- Public Health and Emergency Response Agencies define measures of essential elements of information communicating Situational Awareness needs
- Hospitals and other healthcare provider organizations (e.g., ambulatory clinics, pharmacies, others) collect data locally from relevant information systems.
- A SANER Server aggregates data from relevant systems into a combined report to Public Health and Emergency Response Agencies through the local public health network.
- Data is shared as appropriate at the local, regional and national level



Not All Measure Sources are Created Equal

A Complete Reporting Approach

- SANER SMART on FHIR App
  - Authorizes with Hospital EHR
  - Queries for Applicable Data
  - Creates Measure Reports from EHR
  - Stored to SANER Server
- SANER Server
  - Collects Data from
    - SANER SMART on FHIR App
    - Other Data Sources (e.g. Bed Management, ICU Central Monitoring)
  - Report Measure Data to
    - Local Command and Control
    - Regional/State Public Health



Texas STAR HIE / SANER Pilot

- Texas Health Services Authority received funding from ONC under the STAR HIE cooperative agreement to pilot test the SANER specification with one or more hospital partners
- Audacious Inquiry is supporting as technical vendor
- Coordinating development of SANER SMART on FHIR App and SANER server to demonstrate automated data exchange among hospitals and state and local public health authorities
- Coordinating with CDC and US Digital Services, local agencies in Texas, and Vendors

Features of SANER

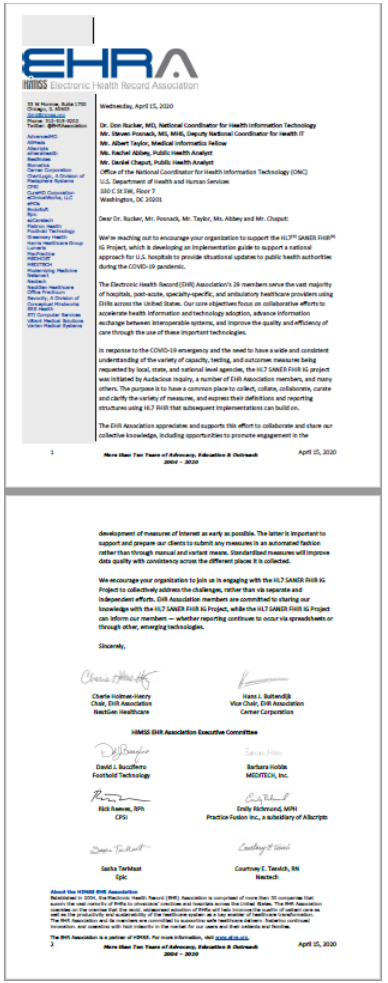
- Automated Reporting via FHIR
- Integration with non-FHIR based systems through CSV Files
- Data Aggregation across multiple systems
- Applies Process Controls to Measurement
- Links Measurements to Essential Elements of Information
- Enables stratification by any computable attribute: Age, Gender, Race and Ethnicity, Geography, Comorbidity, Health Risk Factors, Outcomes
- Enables line level data reporting for risk adjustments, research and analysis
- Open-Source Implementations

Interoperability Need: COVID-19 Novel Coronavirus Pandemic

Standards Process Maturity:	Balloted Draft (STU estimated May 2021)
Implementation Maturity:	Pilot (STAR HIE Pilots)
Adoption:	Low
Federally Required:	Yes, by definition, as it appears in THSA STAR HIE Grant, really No.
Cost:	Free
Test Tool Availability:	Yes: Inferno Community Edition

Industry Support

Vendor	HL7 May 2020	HL7 September 2020	HL7 January 2021	IHE NA 2021
Cerner	√	√	√	√
Epic	√	√		√
GE Healthcare	√			
Lyniate	√			
Microsoft	√	√		
Nextgen Connect	√	√		
ESRI	√			√
Audacious Inquiry	√	√	√	√
CDC		√	√	√
Lantana	√	√	√	√
MITRE	√	√		



Future Considerations

- Continued support for development and piloting by Federal Agencies
- Promote greater collaboration among the health IT and disaster response communities to better align subject matter EEIs and technical standards
- Ensure that efforts around pandemic response include recognition of needs in other public health emergencies and disasters
- Ongoing integration of SDOH data requirements to better understand health care disparities
- Foster engagement with healthcare Supply Chain and Workforce vendors

Questions?