2021 HIMSS Interoperability Showcase White Paper

September 2021

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Breaking Down Barriers Between Clinical Care and Public Health through Streamlined Data Exchange

Introduction

Electronic Health Record (EHR) systems provide a wealth of information to support public health surveillance and reporting. The Centers for Disease Control and Prevention (CDC) is demonstrating standardized data exchange in the 2021 HIMSS Interoperability Showcase to support cancer reporting, vital records reporting, electronic case reporting (eCR), occupational data for health, COVID medication administration and Making EHR Data More Available for Research and Public Health (MedMorph). This white paper describes a few of those efforts (e.g., vital records and occupational data for health).

Vital Records Reporting

Description of Program

The National Vital Statistics System (NVSS) is the oldest and most successful example of inter-governmental data sharing in Public Health. The system, which is based on shared standards and procedures, is the mechanism by which the National Center for Health Statistics (NCHS) collects and disseminates the Nation's official vital statistics. These data are provided through contracts between NCHS and vital registration systems operated in the various jurisdictions legally responsible for the registration of vital events – births, deaths, marriages, divorces, and fetal deaths (https://www.cdc.gov/nchs/nvss/index.htm). The goal of the NVSS is to produce timely, accurate, high quality data based on birth and death certificates, and fetal death reports to inform public health at the local, state and national levels.

For more than a century, these vital events have been collected in accordance with state and jurisdictional laws. Currently, there are 57 registration jurisdictions -- the 50 states, two cities (New York and Washington DC), and 5 US Territories (American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the US Virgin Islands). Detailed data on all events are transmitted to NCHS for processing and dissemination so that NCHS can produce national multi-purpose statistics. There are about 4 million births, 3 million deaths, and 50,000 fetal deaths in the US each year.

NCHS closely collaborates with each individual jurisdiction, the National Association for Public Health Statistics and Information Systems (NAPHSIS), and the World Health Organization on the standardization of the information collected on vital records. NCHS, the jurisdictions, and NAPHSIS focus on developing standard certificates and reports as well as standardized procedures for data preparation and processing to promote a uniform national database.

Impact on PH Practice

Vital statistics inform key national and state level health and healthcare-related programmatic and policy decisions. The data are used to measure progress toward national and state health objectives, such as Healthy People 2000-2030 goals and are the basis for identifying emerging health trends. Examples are data on teen childbearing, prenatal care, cesarean, preterm and low birthweight rates, neonatal infection, infection during pregnancy, infant and maternal mortality, and cause of death such as suicide and opioid-related deaths. Selected vital statistics measures such as the cesarean delivery rate, the preterm birth rate, and selected causes of death are now available 6 months after the date of the event and are updated when final data becomes available.

Recent examples of important public trends identified through vital statistics data include:

- Rise in COVID related mortality rates
- Dramatic rise in opioid related deaths
- The dramatic rise and more recent decline in the multiple birth rate.

- The recent decline in the cesarean delivery rate in the US.
- The rise in the preterm birth rate, especially in infants born late preterm (34-36 weeks of gestation).
- The increase in Sudden Infant Death and Sudden Unexplained Infant Death Syndromes (SIDS/SUIDS).
- The recent increase in death rate attributed to drug overdose occurring nationally and in each jurisdiction.
- The recent decline in life expectancy.

Interoperability of EHR and VR Systems

Many data items required by birth and death certificates and fetal death reports are captured in medical records. For example, the mother's and infant's medical records are recommended by NCHS and NAPHSIS as the source for more than ½ of all data items collected on the 2003 US Standard Certificate of Live Birth and the US Standard Report of Fetal Death. These data typically are gathered by hospital personnel from the hospital's medical records using paper worksheets. However, NCHS and NAPHSIS has been collaborating on standards development so that Electronic Health Records (EHRs) can capture the common items in a way that they can be electronically transferred to the vital record. This will reduce duplicative entry by hospital and other medical personnel and improve data quality. Activities are underway to support the development of interoperability specifications for birth, death, and fetal death and to identify existing gaps that need to be addressed to support data exchange and interoperability of vital records information. Through NCHS funded special projects, Michigan and Utah are developing a SMART on FHIR app to validate the Birth and Fetal Death (BFDR) implementation guide and evaluate the quality of data when EHR data are interoperable with the Electronic Birth Registration System.

NCHS has been collaborating with NAPHSIS and other vital records stakeholders on vital records standards that are supported by the standards development organization (SDO), Health Level Seven International (HL7) and the standards organization, Integrating the Healthcare Enterprise (IHE). HL7 is one of several [American National Standards Institute (ANSI)](#) accredited SDOs operating in the healthcare arena to produce clinical and administrative data standards for the healthcare domain.[1] IHE promotes the coordinated use of established standards such as DICOM (Digital Imaging and Communications in Medicine) and HL7 to address specific clinical needs in support of optimal patient care.[2]

NCHS sponsored a project that was approved and supported by the HL7 Public Health Work Group (PH WG) to develop an HL7 Vital Records Domain Analysis Model (VR DAM). The VR DAM identifies and describes the activities and data required for processing birth, death and fetal death records in compliance with the 2003 Revision of the U.S. Standard Certificates of Birth and Death, and the 2003 Revision of the U.S. Standard Report of Fetal Death. It facilitates consistency in the content and encoding of required vital records data and helps to ensure that HL7 standards

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[1] Health Level Seven International. Retrieved December 12, 2018, from http://www.hl7.org/.

[2] Integrating the Healthcare Enterprise. Retrieved December 12, 2108 from http://www.ihe.net/.

developed for the vital records domain are derived from a common authoritative set of workflow and information requirements.

The VR DAM was first published as an HL7 standard in April 2011 and has been updated annually to stay in sync with continued vital records standards development.

Recent NCHS standards activities, in partnership with other vital records stakeholders, have been focused on developing HL7 fast healthcare interoperability resources (FHIR) implementation guides (IGs) as standards for trial use (STU) for birth, death and fetal death reporting. Initial efforts were devoted to transmitting live birth, fetal death and death-related medical and health information from a provider setting to the vital records electronic registration systems. Future work will extend the information flow from providers to jurisdictions and bi-directional from jurisdictions to the NCHS and back to jurisdictions, returning coded cause of death, and race and ethnicity codes for death and fetal death information.

Related to mortality reporting, an HL7 release of the Version 2.6 Implementation Guide for Vital Records Death Reporting was also published as of 2021. Current work includes the development of an HL7 FHIR IG for Death Reporting for the bi-directional, electronic exchange of data between jurisdictional Electronic Death Registration Systems and NCHS, based on the 2003 revision of the U.S. Standard Death Certificate. The HL7 Vital Records Death Reporting (VRDR) FHIR IG STU 1 was published in October 2020. Additionally, there is current development of an HL7 Medicolegal Death Investigation (MDI) FHIR IG that is planned to be balloted in January 2022. The MDI FHIR IG will focus on testing interoperability of data flows between Medical Examiners' / Coroners' Case Management Systems (ME/C CMS) and Electronic Death Reporting Systems (EDRS).

Standards activities for vital records are also taking place within the Integrating the Healthcare Enterprise (IHE) organization. This work is supported by the IHE Quality, Research and Public Health (QRPH) Committee. NCHS collaborated with QRPH to modify the IHE Maternal and Child Health (MCH) Technical Framework Supplement. The MCH Technical Framework Supplement describes the content to be used in automating the data captured for vital records purposes such as for the U.S. Standard Certificate of Live Birth and the U.S. Standard Report of Fetal Death. The Supplement describes how select information may pre-populate the vital records systems and potentially other stakeholder information systems for birth and fetal death events via the mechanism provided by the Request Form for Data Capture (RFD) integration profile. Additionally, NCHS facilitated the development of the IHE Birth and Fetal Death-Enhanced Reporting (BFDR-E) Profile that describes the content and format to be used within the pre-population data part of the Retrieve Form Request transaction from the RFD Integration Profile. This profile describes the content to be used in automating the data captured for vital records while adhering to the Birth Edit Specifications for the 2003 Revision of the U.S. Standard Certificate of Birth and the Fetal Death Edit Specifications for the 2003 Revision of the U.S. Standard Report of Fetal Death. NCHS has also worked with the QRPH committee to develop the IHE Vital Records Death Reporting (VRDR) Technical Framework Supplement to convey death related information using pre-population of data (using a medical summary) from EHRs to Jurisdictions. The IHE specifications support the HL7 implementation guides by providing derivation rules, terminology sets and mappings to the upstream workflows of the EHR to jurisdicational vital records systems.

As previously mentioned, Utah and Michigans vital records offices are utilizing both the IHE specification and the HL7 BFDR FHIR IG to pilot test the SMART on FHIR application focusing on data quality on data that is harvested from an EHR.

In October 2020 NCHS launched the NVSS Modernization Community of Practice (https://www.cdc.gov/nchs/nvss/modernization/cop.htm), a virtual forum for sharing ideas, technical tools, resources, and promising practices to improve birth and death data.. The COP offers a number of touch points to bring the community together including two monthly calls comprised of a combination of state presentaitons and NCHS led trainings, weekly office hours where vendors and states can ask technical questions and online repositories of training materials and tools to faciliate on demand learning. The COP is meant to be a constellation of communities, with a vision of having self-sustaining subgroups formed based on topics of mutual interest with leadership from within the community. To this end, a number of subgroups have spiraled off the main COP that relate to interoperabiity between ME/C Case Mangement Systems and EDRS and EHRs and EDRS and bring back lessons to the larger community.

For the past several years, NCHS has been engaged in testing and demonstrating interoperability with state partners and system vendors at the IHE Connecthaton and Health Information Management Systems Society (HIMSS) Interoperability Showcase utilizing these HL7 and IHE developing standards. In 2020, NCHS participated in IHE connecathon in January 2020 and the HL7 connectathon in Sept 2021 and tested with the followign partners:

In 2021 NCHS will be show casing bidirectional FHIR based interoperability between a state and NCHS during the HL7 FHIR connectathon in Sept 2021. During the HL7 connectathon, NCHS will be validating the VRDR FHIR IG by testing FHIR based interoerability between EDRS and NCHS as well as between ME/C Case Mangement System and EDRS in collaboration with state based partners and vendors. Numerous jurisdcitions from the NVSS Modernization Community of Pratice including UT, GA, MN, NYC, HI, NYS and NYC will be particiapting in this event. (NCHS continues to reach out to additional EHR and Health Information Exchange (HIE) vendors to expand vital records interoperability capabilities to additional stakeholders.

State based partners have made significant strides in working towards FHIR based interoperability. While this is by no means an exhaustive list, it is meant to provide some examples of the types of activities that state vital records offices.
1. In early 2021, DC went into production with FHIR based interoperability between their ME/C systems and EDRS for their entire jurisdiction.
2. Florida is exploring FHIR based interoperability between their laboratory management information system and medical examiner/coroner case management system.
3. California carried out a return on investment (ROI) that demonstrated substantial cost savings from moving to a FHIR and developed a prototype of a FHIR enabled mobile solution for death certification to improve communication between funeral homes, medical certifies and electronic death registration systems.
4. Georgia is one of a handful of states e looking at FHIR as an end-to-end solution. They have successfully tested EDRS to NCHS and are currently working with three vendor – MDI log, Verti Q and Coroners case management systems to achieve FHIR based

interoperability with EDRS. Georgia went live with FHIR based interoperability between MDI log to EDRS with one ME/C office in May 2021.

5. Utah and Michigan are looking at the application and use of SMART on FHIR for birth certification (EHRs to EBRS) and its impact on data quality.
6. Utah is working on a cost benefit analysis of using SMART on FHIR for mortality reporting.

NCHS is working closely with Federal, State, and local partners in pursuit of a common goal of making more accurate and timely data available for public health surveillance and decision making in near real-time. We are focused on adopting best practices for information exchange that put less burden on data providers while providing more timely and automated data to improve public health and public safety.

Occupational Data for Health

Description of program

The National Institute for Occupational Safety and Health's (NIOSH) mission is to develop new knowledge in the field of occupational safety and health and to transfer that knowledge into practice. NIOSH has been working to provide a framework for the incorporation of work information into electronic health records (EHRs) in a manner that will improve clinical care, provide opportunities to improve population health across healthcare systems, and support public health activities such as case reporting and occupational health surveillance.

EHRs and information about a patient's work

EHRs have created the possibility that a patient's work information can be effectively collected, displayed, and transmitted in a manner that could profoundly change the delivery of healthcare and the collection of data for public health. Professional societies representing physicians practicing internal medicine, family medicine, and obstetrics have long called for a discussion of work with patients.[1-3] In addition, the Joint Commission in 2015 started requiring occupation to be recorded in the health records of patients participating in a Primary Care Medical Home.[4] During a research project, NIOSH interacted with primary care providers who expressed strong interest in having useful work information available in the EHR.[5] However, at the present time work information is not consistently collected, structured, or complete in the medical record and thus may be of limited use to the care provider.

The importance of useable work information in EHRs has been recognized by multiple stakeholders. In 2011, a committee of the Institute of Medicine concluded that work information could contribute to the meaningful use of EHRs and outlined the need to demonstrate collection methods, prepare requirements for storing and communicating work information, and adopt standard vocabulary for industry and occupation.[6] In 2015, the Office of the National Coordinator for Health IT (ONC) recommended inclusion of structured work information to improve care and interoperability.[7] In 2018, a committee of the National Academy of Sciences also called for inclusion of work information in EHRs to improve efficiencies in collection of occupational health surveillance data.[8] More recently, the Pew Charitable Trusts wrote a letter urging ONC to advance work information into future EHR certification criteria.[9] Other stakeholders who have called for inclusion of structured work information in EHRs have included the Council of State and Territorial Epidemiologists (CSTE), the American Public Health Association (APHA), the American College of Occupational and Environmental Medicine (ACOEM), and the Association of Occupational and Environmental Clinics (AOEC).

Without structured work information in EHRs, the relationship of work to health can go unrecognized in the healthcare setting. In 2018, ONC proposed a new process for data elements to be included in EHR certification criteria: U.S. Core Data for Interoperability (USCDI). Work information as a data class is currently at level 1.[10] Until structured work information is incorporated in the medical record of EHRs, it cannot be used by information systems to provide clinical decision support, review patient populations vis-à-vis characteristics of work, and

accomplish efficient public health reporting of work-related conditions. Therefore, opportunities for prevention, accurate diagnosis, successful disease management, and return to work are missed. Failure to recognize occupationally related illness and injury in the clinical setting increases the burden on the workforce and employers due to missed opportunities for public health intervention to protect co-workers in particular workplaces, and to intervene across an occupation, job task, and/or industry. This is particularly notable when hazards are emerging in the workplace. Work information also can be used to support public health infectious disease emergency response activities.

Occupational Data for Health

There are multiple facets of work that are important. Employment status, specific conditions of work, and hours of work are among the work-related factors that affect health. A person's longest-held occupation could be affecting his or her health, rather than the person's current job, due to delayed onset of symptoms. Workers in some occupations or industries would benefit from regular diagnostic screening. In response to the need and opportunity to add work information to EHRs, NIOSH created Occupational Data for Health (ODH). NIOSH partnered with experts in occupational health, occupational medicine, clinical care, public health, and heath informatics standards to prepare a framework of critical informatics products for the incorporation and use of work information in interoperable health IT systems.

ODH includes an information model, standardized vocabulary available in the Public Health Information Network Vocabulary Access and Distribution System (PHIN VADS), how-to guides for implementers, and interoperability standard-templates for incorporating ODH in data sharing transactions.11-14 The ODH model and vocabulary describe a set of standardized, coded, and related data elements about a person's job and work history designed to support clinical care of workers and their families, healthcare population health assessments, and public health surveillance.15 The ODH EHR system functional requirements are expressed in an HL7 functional profile, and NIOSH developed A Guide to the Collection of Occupational Data for Health based on usability testing of a series of software prototypes to illustrate requirements for capture of ODH in the clinical environment. ODH interoperability standards-templates are available for testing and use in all three HL7® product lines, and in the Integrating the Healthcare Enterprise (IHE) Patient Care Coordination (PCC) Technical Framework. These templates have already been incorporated in several implementation guides and profiles for clinical care and public health use cases.

With the ODH resources, health IT developers can successfully implement structured work information into EHRs for use by clinicians and public health. NIOSH is seeking champions in healthcare to advocate for inclusion of ODH in their health IT systems and support meaningful ways to use work information in clinical settings. The latest resources will posted on the NIOSH EHR website.

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