Fast Healthcare Interoperability Resources (FHIR): A New Paradigm for Exchanging Health Information

Briefing Prepared for the National Committee on Vital and Health Statistics Full Committee

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Overview

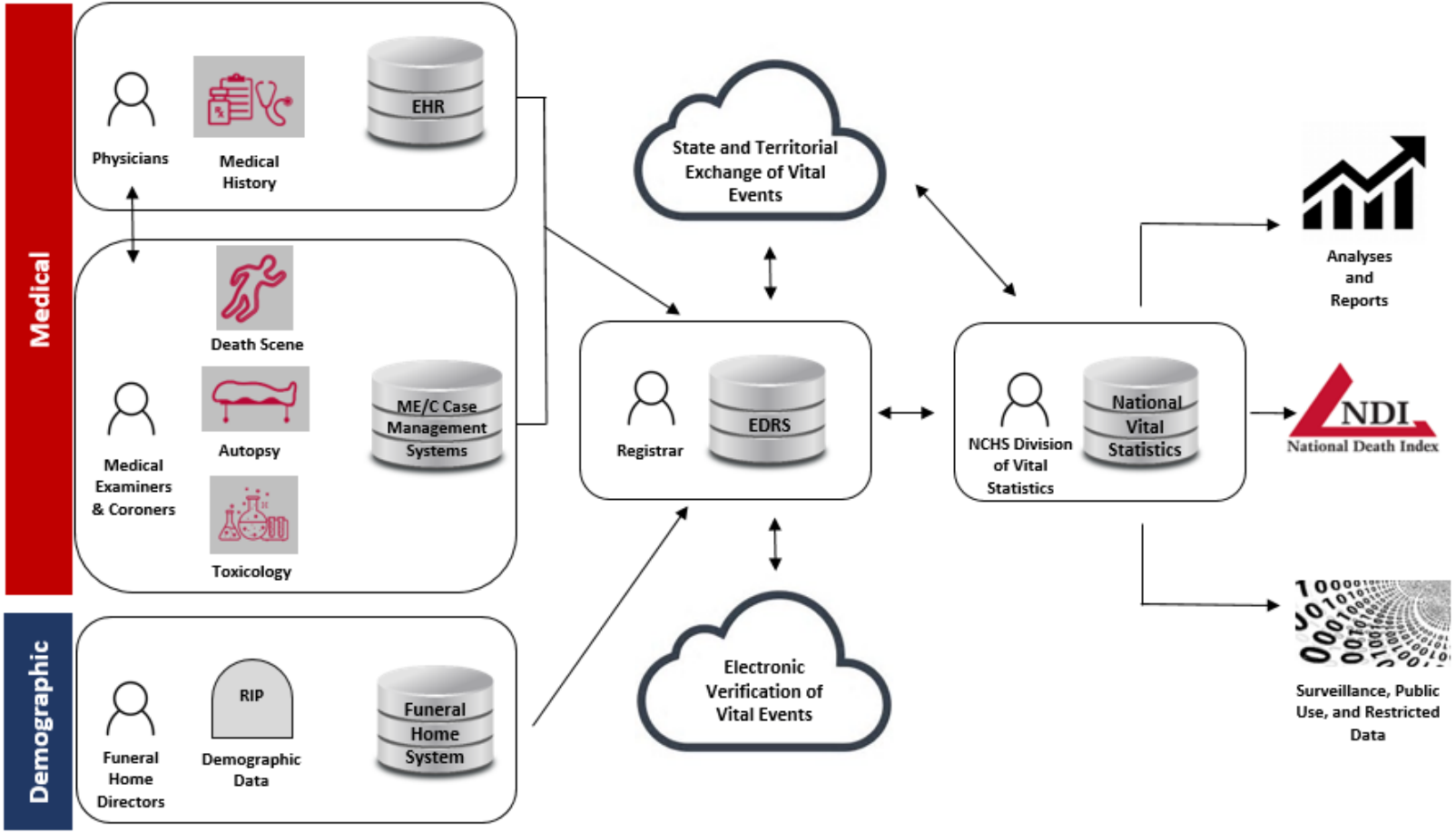
- Brief Introduction to HHS Entrepreneur in Residence Program and CDC/NCHS Modernizing Mortality Systems Project
- Overview of Fast Healthcare Interoperability Resources (FHIR)
  - Evolution of Health Level 7 (HL7) Standards
  - New Paradigm for Exchanging Health Information
- FHIR-in-Action in Vital Statistics and Public Health
- Fresh Opportunities and Current Limitations
- Question & Answer

HHS Entrepreneur-in-Residence

Tapping into outside talent to solve complex problems in health and the delivery of human services


The HHS Entrepreneurs-in-Residence Program

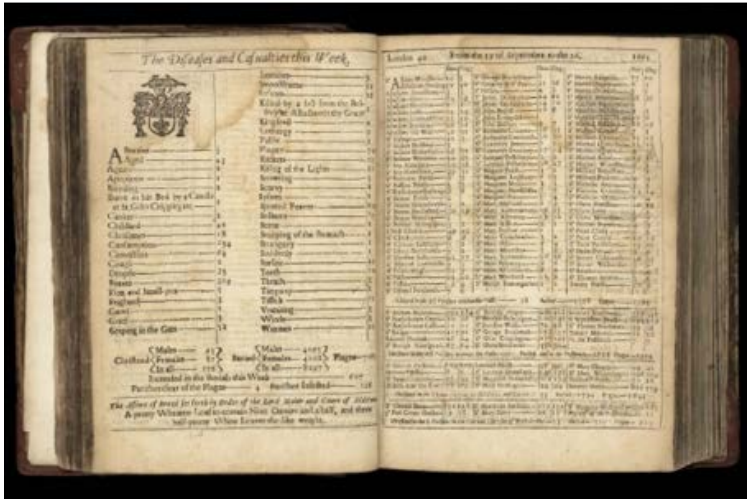
CDC EIR Project: Modernizing Mortality Data Systems



Vision for the Modernizing Mortality Data Systems Entrepreneur-in-Residence (EIR) Project

- Make it easier for Mortality Data Providers
  - Provide more specific and up-to-date mortality information to public health and public safety partners
  - In a coordinated, consistent, and secure way
  - Across jurisdictional boundaries
  - With the ability for mortality data providers and data requestors to get more value out of the data being collected
  - Without workflow disruption to data providers or data requestors

Potential to Transform Public Health Surveillance



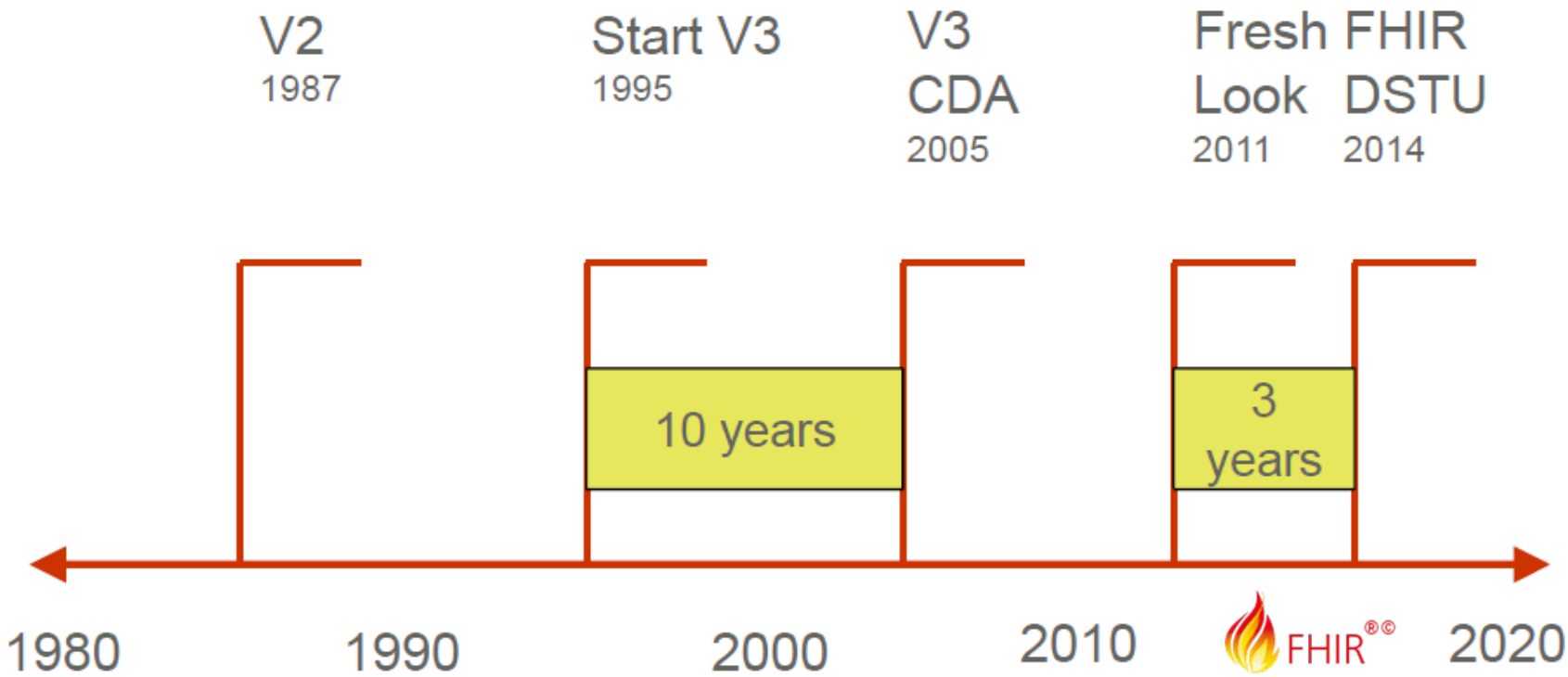
FHIR Overview

Get the IT to work so we can deliver & help people make sense of health data and ultimately help solve high-priority health challenges

Interoperability: HL7's Mission

"a not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services"

Evolution of Health Level Seven (HL7) Standards: Fresh Look in 2011



What is FHIR®©?
Fast Healthcare Interoperability Resources

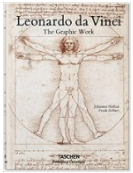
- **Open Community within Health Level Seven (HL7)**
  - Multi-stakeholder teams (of Healthcare Providers, Health IT Vendors, Standards Developers, Payers, etc.) open to all
  - Define priorities, coordinate work, and use modern technologies to exchange health data and open the data for secondary use
- **Standardized Data Model for Exchanging Health Information**
  - Represent data in a standardized way so that health information can be reused by multiple parties for multiple purposes
- **Set of Modern, Internet-Based Technologies that Open Possibilities**
  - Gather specific data needed, apply a range of technologies, and share insights that hadn't easily been shared before

How is FHIR Different?
Unprecedented Adoption and Innovation

- Secure Application Platform Opens Data to Innovation

- Focus on Practicality and Scalability via Web-Based Tools

- Coalescence Among Broad Stakeholders and Early Adopters



Da Vinci Project

Federal Legislative & Regulatory Requirements for FHIR-Like Approach to Making Health Data Accessible

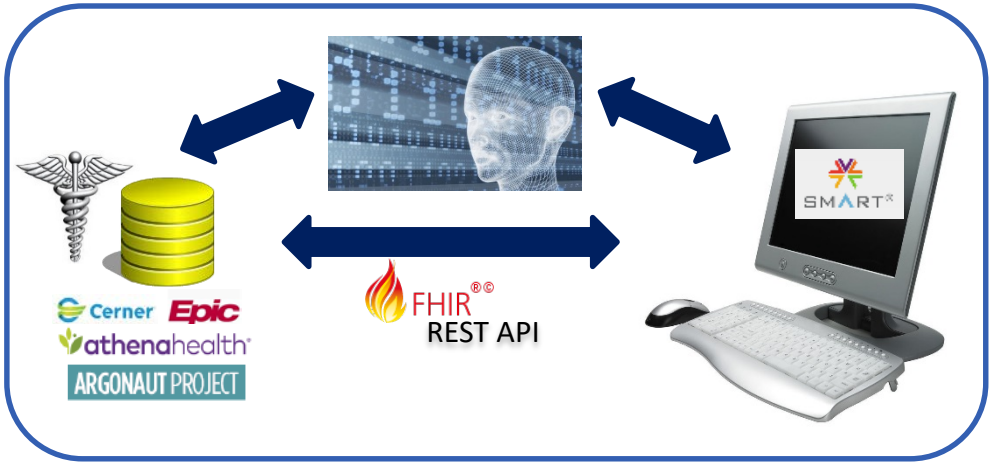
- **21st Century Cures Act**
  - Requires certified EHR vendors to make patient data accessible "without special effort, through the use of application programming interfaces (APIs)."
- **Meaningful Use Regulations (Stage 3)**
  - Provide patients access to their data via APIs
- **FHIR supports**
  - APIs
  - Modern web services
  - Older HL7 paradigms (messages & documents)

FHIR-in-Action in Vital Statistics and Public Health

Using standards to drive innovation in public health

Powerful & Flexible Tool to Help Physicians Determine Chain of Events that Led to Death

+ **Integrate Into Physicians' Workflow**: **Certify Deaths** in the EHR & **Send Electronically** to State
  + **Save Time**: Provide **Medical History** & **Pre-Populate** Demographic/Basic Health Information
    + **Improve Accuracy**: Use **Advanced Computing** to Help Determine **Cause-of-Death Sequence**
      + **Advance Medical Research & Improve Care**: Ability to **Send Coded Data** Back to EHR



State
Electronic Death
Registration System

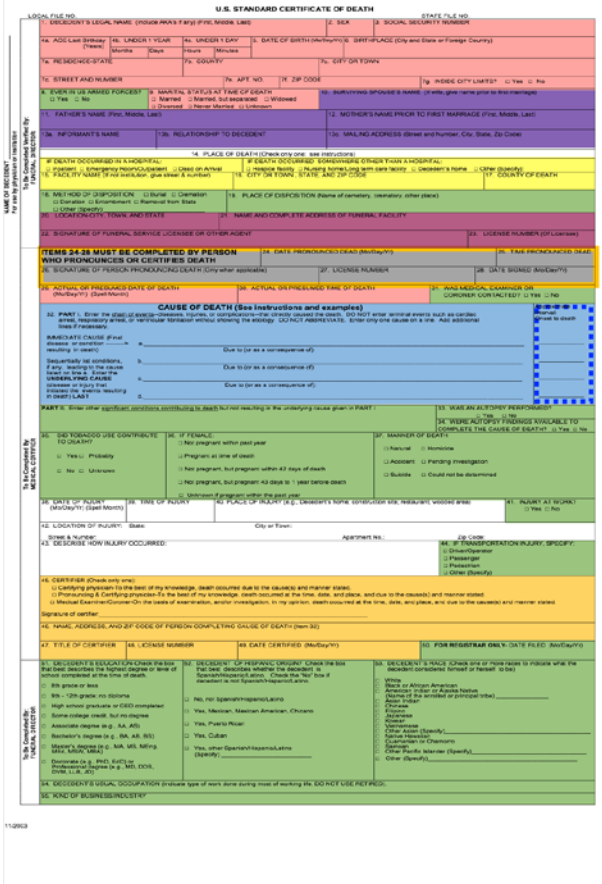
CDC

National Center for
Health Statistics
National Vital Statistics System

Goals of the Death Worm Project

- **Map Death Certificate Data Element to FHIR**
  - Identify relevant FHIR resources and develop profiles for death reporting
- **Develop Clinical Decision Support Tool for Death Reporting**
  - Use SMART-on-FHIR and FHIR APIs to develop a tool that provide physicians information about the decedent's health history and allows physicians to complete death certificates within electronic health records
- **Analytics**
  - Develop machine learning algorithms to help physicians determine sequence of diseases that led to death

Proposed Mappings to FHIR Resources


U.S. STANDARD CERTIFICATE OF DEATH

LOCAL FILE NO. STATE FILE NO.

1. DECEDENT'S LEGAL NAME (Include AKA's if any) (First, Middle, Last) 2. SEX 3. SOCIAL SECURITY NUMBER

4a. Age-Last Birthday (Years) 4b. UNDER 1 YEAR Months Days 4c. UNDER 1 DAY Hours Minutes 5. DATE OF BIRTH (Mo/Day/Yr) 6. BIRTHPLACE (City and State or Foreign Country)

7a. RESIDENCE-STATE 7b. COUNTY 7c. CITY OR TOWN

7d. STREET AND NUMBER 7e. APT. NO. 7f. ZIP CODE 7g. INSIDE CITY LIMITS? ☐ Yes ☐ No

8. EVER IN US ARMED FORCES? ☐ Yes ☐ No 9. MARITAL STATUS AT TIME OF DEATH ☐ Married ☐ Married, but separated ☐ Widowed ☐ Divorced ☐ Never Married ☐ Unknown 10. SURVIVING SPOUSE'S NAME (If wife, give name prior to first marriage)

11. FATHER'S NAME (First, Middle, Last) 12. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last)

13a. INFORMANT'S NAME 13b. RELATIONSHIP TO DECEDENT 13c. MAILING ADDRESS (Street and Number, City, State, Zip Code)

14. PLACE OF DEATH (Check only one; see instructions)

IF DEATH OCCURRED IN A HOSPITAL: ☐ Inpatient ☐ Emergency Room/ED ☐ Dead on Arrival

IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL: ☐ Hospice facility ☐ Nursing home/Long term care facility ☐ Decedent's home ☐ Other (Specify)

15. FACILITY NAME (If not institution, give street & number) 16. CITY OR TOWN, STATE, AND ZIP CODE 17. COUNTY OF DEATH

18. METHOD OF DISPOSITION: ☐ Burial ☐ Cremation ☐ Donation ☐ Entombment ☐ Removal from State ☐ Other (Specify) 19. PLACE OF DISPOSITION (Name of cemetery, crematory, other place)

20. LOCATION-CITY, TOWN, AND STATE 21. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY

22. SIGNATURE OF FUNERAL SERVICE LICENSEE OR OTHER AGENT 23. LICENSE NUMBER (Of Licensee)

ITEMS 24-28 MUST BE COMPLETED BY PERSON WHO PRONOUNCES OR CERTIFIES DEATH

24. DATE PRONOUNCED DEAD (Mo/Day/Yr) 25. TIME PRONOUNCED DEAD

26. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable) 27. LICENSE NUMBER 28. DATE SIGNED (Mo/Day/Yr)

29. ACTUAL OR PRESUMED DATE OF DEATH (Mo/Day/Yr) (Spell Month) 30. ACTUAL OR PRESUMED TIME OF DEATH 31. WAS MEDICAL EXAMINER OR CORONER CONTACTED? ☐ Yes ☐ No

CAUSE OF DEATH (See instructions and examples)

32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.

IMMEDIATE CAUSE (Final disease or condition resulting in death) a. Due to (or as a consequence of)

Sequentially list conditions, if any, leading to the cause a. b. Due to (or as a consequence of)

UNDERLYING CAUSE (Disease or injury that initiated the events resulting in death) LAST c. Due to (or as a consequence of)

d.

Interval between onset and death

PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I

33. WAS AN AUTOPSY PERFORMED? ☐ Yes ☐ No

34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? ☐ Yes ☐ No

To Be Completed By MEDICAL EXAMINER

35. DID TOBACCO USE CONTRIBUTE TO DEATH? ☐ Yes ☐ Probably ☐ No ☐ Unknown

36. IF FEMALE: ☐ Not pregnant within past year ☐ Pregnant at time of death ☐ Not pregnant, but pregnant within 42 days of death ☐ Not pregnant, but pregnant 43 days to 1 year before death ☐ Unknown if pregnant within the past year

37. MANNER OF DEATH ☐ Natural ☐ Homicide ☐ Accident ☐ Pending investigation ☐ Suicide ☐ Could not be determined

38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) 39. TIME OF INJURY 40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) 41. INJURY AT WORK? ☐ Yes ☐ No

42. LOCATION OF INJURY: State City or Town Street & Number Apartment No. Zip Code

43. DESCRIBE HOW INJURY OCCURRED

44. IF TRANSPORTATION INJURY, SPECIFY: ☐ Driver/Operator ☐ Passenger ☐ Pedestrian ☐ Other (Specify)

45. CERTIFIER (Check only one): ☐ Certifying physician-To the best of my knowledge, death occurred due to the cause(s) and manner stated. ☐ Pronouncing & Certifying physician-To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner stated. ☐ Medical Examiner/Coroner-On the basis of examination, and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner stated.

Signature of certifier

46. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 32)

47. TITLE OF CERTIFIER 48. LICENSE NUMBER 49. DATE CERTIFIED (Mo/Day/Yr) 50. FOR REGISTRAR ONLY-DATE FILED (Mo/Day/Yr)

To Be Completed By FUNERAL DIRECTOR

51. DECEDENT'S EDUCATION-Check the box that best describes the highest degree or level of school completed at the time of death. ☐ 8th grade or less ☐ 9th - 12th grade; no diploma ☐ High school graduate or GED completed ☐ Some college credit, but no degree ☐ Associate degree (e.g., AA, AS) ☐ Bachelor's degree (e.g., BA, AB, BS) ☐ Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA) ☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

52. DECEDENT OF HISPANIC ORIGIN? Check the box that best describes whether the decedent is Spanish/Hispanic/Latino. Check the "No" box if decedent is not Spanish/Hispanic/Latino. ☐ No, not Spanish/Hispanic/Latino ☐ Yes, Mexican, Mexican American, Chicano ☐ Yes, Puerto Rican ☐ Yes, Cuban ☐ Yes, other Spanish/Hispanic/Latino (Specify)

53. DECEDENT'S RACE (Check one or more races to indicate what the decedent considered himself or herself to be) ☐ White ☐ Black or African American ☐ American Indian or Alaska Native (Name of the enrolled or principal tribe) ☐ Asian ☐ Indian ☐ Chinese ☐ Filipino ☐ Japanese ☐ Korean ☐ Vietnamese ☐ Other Asian (Specify) ☐ Native Hawaiian ☐ Guamanian or Chamorro ☐ Samoan ☐ Other Pacific Islander (Specify) ☐ Other (Specify)

54. DECEDENT'S USUAL OCCUPATION (Indicate type of work done during most of working life. DO NOT USE RETIRED)

55. KIND OF BUSINESS/INDUSTRY

11/2003

BUNDLE

- Type: doc
- Total: Int[1]
- Signatures

Composition (Entry[0])

- Section → text: Summary (XHTML) (human-readable)

Patient

- <Patient information>

Questionnaire Response? Observations?

- <Question answers>

Practitioner

(for Pronouncing Death)

- <Certifier information>

Practitioner

(for Certifying Death event)

- <Certifier information>

Practitioner

- <Funeral agent information>

Location

- <Place of death>

Conditions

Onset [period]

- <Cause of death>

Related Person

- <Spouse, if applicable>

Related Person

- <Mother>

Related Person

- <Father>

Related Person

- <Informant>

Clinical Decision Support Tool Prototype

Basic patient information, to give context. Seamless return to EHR for more info.

Scroll-able, scale-able timeline for comprehensive view

Familiar chain-of-events layout, allowing changes if needed

Salient plan-text history, with final progress note if available

Hover over events for more details

Clicking on a proposed timeline pre-populates the chain of events

Validate Data Before Sending to State

Current Status of the Death Worm Project

- **Map Death Certificate Data Element to FHIR**
  - US 2003 standard death certificate mapped to FHIR resources
  - Development of profiles for death reporting underway
- **Develop Clinical Decision Support Tool for Death Reporting**
  - Application tested against Cerner's FHIR developer sandbox to ensure compatibility
  - Application to be tested at IHE Connect-a-thon in January 2018
- **Analytics**
  - Initial work promising but additional work needed in this area (especially on data sets where detailed health record data are linked with death certificate data)

FHIR Projects in Public Health: Collaboration with GT

Fresh Opportunities and Current Limitations

Putting the technical underpinnings in place to maximize the value of existing health data

Guiding Principles When Considering Pros and Cons of Existing Standards

- Don’t try to solve every problem. Focus real-world projects with committed and ongoing involvement.
- Technology improves as people use it. The best metric of success is sustained use.
- Test and see what works. Don’t try to make it perfect. Make it much better, through a series of sprints, with the tools that currently exist.
- Involve implementers early and often. People are more likely to adopt standards when they don’t have to do anything special to make it work.
- When considering where to invest resources (money, time, attention), distinguish “price” from “cost” and “value”.
- Adopt industry best practices for privacy and security.

Considerations for the National Committee on Vital and Health Statistics

- What change do you seek to make?
- How can vital and health statistics data collection better fit within data providers' workflow?
- What are the most important things that need to be done?
- How can we work together to set priorities and promote as much coordination and consistency as early as possible in the process?
- What do vendor products currently have the capacity to do? What functionality needs to be added to core products? What options do we have to bridge any gaps?
- What workforce capabilities currently exist and how can they be enhanced?

Questions?

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TTY: 1-888-232-6348 www.cdc.gov