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MDI Data Standardization and FHIR Standards Development

Version 2.1

6/2/2025

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Submitted by:

Project: CDC-NCHS-MDI FHIR IG
Contract #: 00HCAKLC-2024-88585
Task 7: White Paper Update

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1 Introduction

The Centers for Disease Control and Prevention (CDC) is supporting interoperability and data-exchange modernization for death investigation data and death certification as well as vital-statistics reporting. Part of that modernization effort has been the expansion of Health Level Seven International® (HL7) Fast Healthcare Interoperability Resources® (FHIR) standards for data exchange within the entire vital-statistics and death-reporting information "ecosystem." Information from medical examiners, coroners, and others in the medicolegal death investigation (MDI) community are a crucial part of death reporting and can contribute significantly to public health when exchanged accurately and in a timely manner.

The Medicolegal Death Investigation FHIR Implementation Guide (MDI FHIR IG)[1] specifies structured data-element resources exchanged between parties involved in death investigation dataflows; it does not yet specify the interaction or service requirements that would be needed for application programming interfaces (APIs), triggers, etc. The MDI FHIR IG has developed through several updates and HL7 ballot review cycles:

- HL7 ballot for MDI FHIR IG, Standard for Trial Use (STU) 1 (2022-03-28)
- Publication of MDI FHIR IG, STU 1 (2022-09-30)
- Publication of MDI FHIR IG, STU 1.1 with technical corrections and minor updates to STU 1 (2023-11-16)
- First HL7 ballot for MDI FHIR IG, STU 2 (2024-04-05) with new dependency on Vital Records Common Library (VRCL) and Vital Records Death Reporting (VRDR) FHIR IGs
- Second HL7 ballot for MDI FHIR IG, STU 2 (2024-12-12) with additional resources to support death certificate review
- Publication of MDI FHIR IG, STU 2 (2025-05-15)

The first version of this document, "MDI Data Standardization and FHIR Standards Development", was completed 3/31/2023, before launching the MDI FHIR IG STU 2 development efforts. The current version of this document reflects changes in the FHIR standards environment and the MDI community's evolving interest and ability to exchange standardized data electronically. The goal of this document is to be a living record of MDI data standardization efforts and to inform future updates to the MDI FHIR IG, identifying where stakeholders agree and where the MDI community has shared data-exchange needs. Information for this document has come from:

- Reviews of the data-exchange standards landscape relevant to the MDI community
- Discussions held December 2022 through March 2023 with subject-matter experts and stakeholders.
- Discussions held during CDC and CDC Foundation events.

The authors greatly appreciate the input from the MDI community and look forward to further discussions. (See Discussion Participants for more information.)

The MDI FHIR IG is based upon FHIR R4.0.1 and is a US Realm specification. It reuses or further constrains FHIR resources published in the following FHIR IGs:

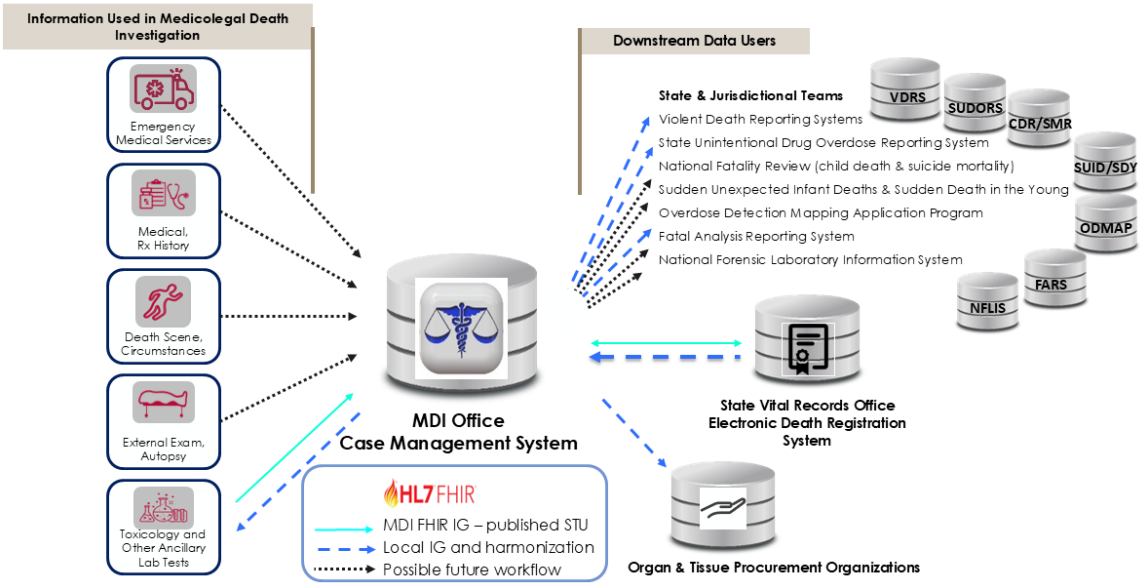
[1] HL7, MDI FHIR IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=604 & http://hl7.org/fhir/us/mdi/

- HL7 FHIR® Implementation Guide: Vital Records Death Reporting (VRDR):[2] This implementation guide (IG) defines data elements used by jurisdictional electronic death reporting systems (EDRS) for reporting deaths to the National Center for Health Statistics (NCHS). Data originating in the MDI community is a crucial subset of these VRDR data elements.
- HL7 FHIR® Implementation Guide: Vital Records Common Library (VRCL):[3] This IG defines profiles that are shared by the MDI FHIR IG and VRDR, as well as the Birth and Fetal Death Reporting (BFDR) FHIR IG[4].
- HL7 FHIR® US Core Implementation Guide:[5] This implementation guide aligns with US Core Data for Interoperability (USCDI). The MDI FHIR IG uses profiles defined in this IG.

It is important that medical examiners, coroners, forensic pathologists, and others in the MDI community engage with and provide feedback to HL7 and other standards-development organizations (SDOs) as these and other FHIR standards evolve.

Figure 1 illustrates the current and possible future dataflows defined by the MDI FHIR IG.

Figure 1: Exploring New Dataflows for MDI



[2] HL7, VRDR IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=532 & http://hl7.org/fhir/us/vrdr/
[3] HL7, VRCL IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=577 & http://hl7.org/fhir/us/vr-common-library/
[4] HL7, BFDR IG, https://www.hl7.org/implement/standards/product_brief.cfm?product_id=575 & https://hl7.org/fhir/us/bfdr/
[5] HL7, US Core IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=500 & http://hl7.org/fhir/us/core/

2 Context and Background

The goals of standardizing death data definitions and structures are:

- To ensure data collected during death investigations and/or exchanged using medicolegal death investigation case management systems (MDI CMS) are not lost in transmission and meaning is not altered
- To reduce the burden on MDI offices and data exchange partners by enabling an enter-once-and-reuse approach to death data exchange
- To reduce the chances of data entry errors by enabling data reuse and avoiding data re-entry
- To speed delivery of death data needed by families, jurisdictions, and public health and safety entities

2.1 A Brief History of Death Data Standardization Efforts

Established in 1986, the Medical Examiner/Coroner Information Sharing Program (MECISP) at CDC reviewed data collected during death investigations and stored in electronic databases at medical examiner and coroner offices (MDI offices) in the US.[6] This program built on earlier recommendations by the National Commission on Forensic Science (NCFS) on the need for electronic communications for medical examiner and coroner offices in the US.[7] MECISP compiled the findings to document commonalities among MDI CMS electronic databases used for mortality monitoring and research. The results were published in 1995 as the "Medical Examiner/Coroner Death Investigation Data Set (McDIDS)". McDIDS provided guidelines for additional MDI offices that were still developing electronic death investigation databases (many of them "home-grown") to promote collection of an agreed upon list of data elements with the goal of facilitating a nationally uniform approach to death investigation, collection of information, and electronic data base development and structure. This effort was an essential step in modernizing mortality monitoring and research in the US.

After McDIDS established death investigation data guidelines, collaboration continued among multiple agencies including MDI offices, public health and professional organizations. These collaborations led to a 2021 report by US Department of Commerce National Institute of Standards Technology (NIST), Organization of Scientific Area Committees (OSAC) for the Forensic Science's MDI Subcommittee. This report, "Medicolegal death investigation data commonly collected and exchanged", built on the work of McDIDS and provided important background information on the needs for MDI data and specified the most salient data to collect during the course of an investigation.

The OSAC report also highlighted opportunities and challenges for standardizing and exchanging MDI data and identified HL7 FHIR and the National Information Exchange Model (NIEM) as the two data standards most relevant to MDI data exchange modernization efforts.

In response to the OSAC report, CDC's NCHS, engaged a team at Georgia Tech Research Institute (GTRI) to analyze what FHIR resources would support exchange of MDI data elements identified by both McDIDS and the OSAC report. The result was an initial mapping of MDI data to FHIR. CDC then engaged the Lantana Consulting Group to create an HL7 FHIR implementation guide (IG) for an initial set of MDI data, with a priority given to those data needed from MDI offices for

[6] Hanzlick (1997), https://pubmed.ncbi.nlm.nih.gov/9144947/
[7] NCFS (2015), https://www.justice.gov/ncfs/file/787351/dl?inline & https://www.justice.gov/archives/ncfs/work-products-adopted-commission

jurisdictional EDRS to complete high quality and timely death certificates. The first MDI FHIR IG (STU 1) was published September 2022.

At the same time, CDC's NCHS was also supporting the development and testing of the Vital Records Death Reporting (VRDR) FHIR (VRDR FHIR IG) for reporting death data to NCHS for compilation and public use. The second version of the MDI FHIR IG (STU 2) made use of the VRDR FHIR IG by referencing many of its FHIR resources being tested and adopted by EDRS. This allowed the MDI IG to become more streamlined (by re-using resources defined in the VRDR FHIR IG) and eased the adoption effort for MDI offices and EDRS that were already becoming familiar with the VRDR FHIR resources. Finally, NCHS has supported individual MDI offices to collaborate with data sharing partners, software vendors and others to implement standards-based data exchange. These projects have resulted in interoperability between MDI CMS and toxicology labs, public health, EDRS, and CDC surveillance programs and have helped further refine the MDI FIHR IG.

With the FHIR standards of death data exchange for developing death certificates becoming more widely adopted, future versions of the MDI FHIR IG have the opportunity to support additional workflows important to the MDI community and mortality research for public health. Important resources for the ongoing development of MDI data modernization include:

- **CDC COMEC**: The CDC continues to support interoperability and data exchange modernization among MDI offices through the Collaborating Office for Medical Examiners and Coroners (COMEC)[8], and at: MDI@cdc.gov.
- **CDC Foundation**: The CDC Foundation[9] provides administrative and project management support for medical examiner and coroner jurisdictions, data sharing partners, and software vendors participating in FHIR pilot projects. CDC Foundation also provides a forum for a community of support through MDI Connect[10] to advance solutions for simplifying data sharing between MDI offices and their partners.
- **GTRI**: Georgia Tech Research Institute (GTRI) provides tools for exploring and testing MDI FHIR data:
    - Raven Testing Platform[11]—A proof of concept for the MDI FHIR IG. It provides a tool for testing conformance to the MDI FHIR IG, including resource validation, record comparison, and data exchange workflows.
    - Raven Documentation[12]—End-use and technical manuals
- **HL7**: The Public Health Work Group (PHWG) sponsors the HL7 Medicolegal Death Investigation (MDI) FHIR IG project.[13]

2.2 Adopting FHIR for Standardizing MDI Data Exchange

The death-investigation data landscape now includes data standards defined by FHIR, an architecture for exchanging information via resources that define data elements and APIs for interoperating between applications or computer systems. The data can be exchanged between computer systems regardless of how the data are stored in those systems. FHIR is easy to implement

[8] CDC, COMEC, https://www.cdc.gov/comec/index.html
[9] CDC Foundation, https://www.cdcfoundation.org/
[10] CDC Foundation, MDI Connect, https://www.cdcfoundation.org/MDI-Connect
[11] GTRI, Raven Testing Platform, https://raven.heat.icl.gtri.org/
[12] GTRI, Raven Documentation, https://ravendocs.readthedocs.io/en/latest/
[13] HL7, PHWG, MDI Project page, https://confluence.hl7.org/spaces/PHWG/pages/79513666/Medicolegal+Death+Investigation+MDI

by software developers because it uses widely adopted standards and protocols such as XML, JSON, HTTP, and OAuth. FHIR is now in use by many healthcare organizations, jurisdictional vital-records offices, public-health agencies, and state and federal statistical agencies, among others. For these reasons, it is the data standard of choice for modernizing data exchange involving case management systems used in the MDI community.

A FHIR IG documents how FHIR resources are defined (profiled) and used in specific dataflows. These use-case-specific profiles build upon base resources by adding constraints and/or extensions to the base resources. As base resources are developed and tested, they are each assigned a FHIR Maturity Model (FMM) level.[14] FHIR IGs to be published by HL7 must profile resources that are maturity level 2 or higher. Each data element of the profile has a "cardinality" assigned, which indicates the lower and upper bounds on how many times the data element is allowed to appear in the resource. For example:

- 0..* = Zero to many allowed, so fully optional and may include many
- 0..1 = Only zero or 1 allowed, so optional but no more than 1
- 1..1 = Exactly 1 allowed, so 1 is required
- 1..n = 1 to n allowed, so at least 1 is required

In addition, a FHIR IG defines terminologies (value sets of codes from defined code systems) appropriate to each use case and dataflow. The IG creators assign these terminologies a "binding strength,"[15] as explained below:

- Required: To be conformant, the concept in this element SHALL be from the specified value set.
- Extensible: To be conformant, the concept in this element SHALL be from the specified value set if any of the codes within the value set can apply to the concept being communicated. If the value set does not cover the concept (based on human review), alternate coding (or, data type allowing, text) may be included instead.
- Preferred: Instances are encouraged to draw from the specified codes for interoperability purposes but are not required to do so to be considered conformant.
- Example: Instances are not expected or even encouraged to draw from the specified value set. The value set merely provides examples of the types of concepts intended to be included.

Using common (shared) terminologies is a cornerstone of data exchange interoperability. At the same time, overly restrictive terminology definitions can stifle adoption of data-exchange standards in a diverse information landscape, such as death investigations. Striking the right balance is key to developing data-exchange standards that are useful and can be widely adopted.

The death-investigation data-exchange landscape includes several FHIR IGs, including the three briefly mentioned in the Introduction:

- **FHIR R4** & **R5**: FHIR defines the base resources of many other published IGs. Release 4.0.1[16] (published 10/30/2019) is Normative and is used by the following IGs. FHIR

[14] HL7, FHIR, Versions (maturity), http://hl7.org/fhir/versions.html#maturity
[15] HL7, FHIR Code System, Binding Strength, https://www.hl7.org/FHIR/codesystem-binding-strength.html
[16] HL7, FHIR R4.0.1, http://hl7.org/fhir/R4/

Release 5.0.0[17] was published 3/26/2023. Once published, IGs may be updated to conform to FHIR R5.0.0 or may continue to be published conforming to the Normative R4.0.1. As of May 2025, FHIR R6 is in its third and final "pre-review" ballot, leading into the first R6 normative ballot expected in January 2026. Additional normative ballots may be needed in 2026, meaning that publication may happen in 2026 or 2027.

- **US Core**: Based on FHIR R4.0.1, the current version is US Core 7.0.0 [18] (published 5/8/2024). The US Core FHIR IG is the foundation for other US Realm FHIR IGs. The US Core FHIR IG defines the FHIR resources used to represent USCDI data elements, a standardized set of health data classes and data elements for nationwide, interoperable health-information exchange that is published by the Assistant Secretary for Technology Policy (ASTP). The earlier US Core FHIR IG 5.0.1 (published 6/22/2022) is referenced by the following IGs.
- **VRCL**: Based on FHIR R4.0.1 and US Core 5.0.1, the Vital Records Common Library FHIR IG[19] is a US Realm guide to support the needs of multiple vital-records FHIR IGs. It serves as a source for a standard set of profiles for reuse in multiple use-case-specific IGs focusing on the exchange of vital-records information. VRCL STU 2 was published 10/11/2024.
- **VRDR**: Based on FHIR R4.0.1 and US Core 5.0.1, the Vital Records Death Reporting FHIR IG[20] is a US Realm guide for data required in the bidirectional exchange of mortality data between EDRS and the NCHS. MDI case-management systems are a source for these mortality data. VRDR STU 3 was published 10/16/2024.
- **MDI**: Based on FHIR R4.0.1 and US Core 5.0.1, the Medicolegal Death Investigation (MDI) FHIR IG[21] is a US Realm FHIR IG for the exchange of information between the MDI case management systems, forensic toxicology and other laboratory information management systems (LIMS), and jurisdictional vital records offices' EDRS. It reuses many profiles defined in the vital-records FHIR IGs listed above. It will expand in future versions to support additional dataflows involved in death investigations or using death data.

[17] HL7, FHIR R5.0.0, http://hl7.org/fhir/
[18] HL7, US Core IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=500 & http://hl7.org/fhir/us/core/
[19] HL7, VRCL IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=577 & http://hl7.org/fhir/us/vr-common-library/
[20] HL7, VRDR IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=532 & http://hl7.org/fhir/us/vrdr/
[21] HL7, MDI FHIR IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=604 & http://hl7.org/fhir/us/mdi/

3 Dataflows Between MDI CMSs and Other Systems

The following sections summarize dataflows from information sources (upstream from MDI CMS) and information recipients (downstream from MDI CMS) as well as exchanges for data review. The dataflows examined here are:

- Upstream:
  - Forensic toxicology laboratories
  - Emergency medical services (EMS)
- Downstream:
  - Organ procurement organizations (OPOs)
  - Fatality review teams
  - Teams submitting data to the National Violent Death Reporting System (NVDRS)
  - Teams submitting data for overdose reporting system
- Exchange for review:
  - Death certificate data review

3.1 Upstream Data Sources Important to MDI

3.1.1 Forensic Toxicology Laboratory Information Management System (LIMS)

Exchange of electronic data on toxicological analysis is often cited by the MDI community as a high priority for improving MDI dataflows, in part because of the extensive quantitative information involved and the costs and risks associated with manually entering toxicology data into MDI CMS. The following information is based largely on discussions with NMS Labs.

3.1.1.1 Current State: Dataflows with Forensic Toxicology

The general dataflow for information on samples involved with an MDI case includes:

- MDI system or autopsy facility sends to the toxicology lab:
  - Electronic requisition form (e.g., ORM V2 order message), entered into LIMS
  - Paper/PDF requisition form(s) accompanying sample(s)
  - Physical sample(s)
- Toxicology LIMS returns results to the MDI CMS
  - Human-readable paper/PDF
  - Electronic result message (e.g., HL7 V2 ORU result message) into MDI system

NMS Labs uses HL7 V2.3 as the gold standard for data exchange with MDI systems, however, exchange with some MDI systems requires translation to the MDI custom data format. NMS Labs has a client portal for receiving service-order requests. Recently, the company developed a RESTful API for inbound service-order requests from an MDI system into the client portal. NMS Labs has found shifting to FHIR in the near future to be cost-prohibitive.

3.1.1.2 Desired Near-Future State

Extending the capabilities of MDI CMS to use an API for both sending requisitions and receiving results from forensic toxicology labs should improve dataflow efficiency and reduce manual data entry. For MDI CMS that are FHIR-capable, defining the requisition resources (FHIR profiles, etc.) will be a high priority.

At the data-element level, forensic toxicology labs would like to receive case notes relevant to both the condition of the body or specimen and the circumstances of the death. This information should come with the specimen and lab service requisition and could include a "decomposition" note. The

HL7 V2 specification can accommodate case notes through custom note (NTE) segment functionality, however, it does not define the specimen well for the forensic toxicology lab needs.

3.1.1.3 Technical Details, Barriers, Opportunities

Standardizing forensic toxicology terminology is a significant challenge. For example, Logical Observation Identifiers Names and Codes (LOINC) codes do not exist for many forensic analyte matrix combinations. Developing a strategy for pooling and standardizing terminologies among forensic toxicology labs and with key stakeholders, such as NVDRS and the State Unintentional Drug Overdose Reporting System (SUDORS), which maintain a substance list, is an opportunity for collaboration. (See additional discussion in Standardizing Terminology of Death Investigation Data.)

Forensic toxicology labs are accredited by American Board of Forensic Toxicology (ABFT).[22] Much of the HL7 FHIR profiling work for lab results and specimens adheres to Clinical Laboratory Improvement Amendments (CLIA) rules, which may differ from ABFT in some areas, such as specimens received but not analyzed. Workgroups have discussed reporting rules about data on forensic specimens received but not analyzed in HL7 review of the MDI FHIR IG during initial (STU 1) balloting.

Translation tools for FHIR-V2 may be an important stepping-stone for interoperability. For example, the NMS Labs portal API may be an opportunity for collaboration on FHIR API specifications. The current version of the portal defines the inbound V2 data elements that can be accepted; however NMS Labs may be able to accept more data elements by integrating a FHIR API in the future.

Other recent work on the exchange of lab data includes:

- GTRI developed a V2-to-FHIR (unidirectional) prototype translation tool.
- South Carolina Law Enforcement Division (SLED) Forensic Services[23] is piloting lab reporting to an MDI CMS using FHIR.

3.1.1.4 Next Steps for Continuing Progress

Next steps for the MDI community: Bidirectional exchange of electronic data on forensic toxicology is a strategic priority for improving dataflows and MDI CMS efficiency. Downstream users of MDI data will benefit from the improved upstream flows as well. MDI CMS implementers may wish to collaborate with forensic laboratory software vendors that either have systems that can receive FHIR message bundles or have translation tools for those systems.

Next steps for the MDI FHIR IG project:

- Define a FHIR message bundle for a requisition form to be sent to a forensic toxicology lab.
- Develop API guidance for sending requisitions to and receiving results from forensic toxicology LIMS.
- Review the September 2024 ballot of the HL7 Laboratory Report – Universal Realm[24] and the ongoing IG development in the continuous integration build (CI Build). This project is under the HL7 Orders & Observations work group. It may provide a model for FHIR resources for nesting complex lab results .

[22] ABFT, https://www.abft.org/
[23] SLED Forensic Services , https://www.sled.sc.gov/forensics
[24] HL7, Laboratory Report, https://hl7.org/fhir/uv/lab-report/2024Sep/ & https://build.fhir.org/ig/HL7/uv-lab-rep-ig/

3.1.2 Emergency Medical Services (EMS)

First responders and emergency medical staff are important sources of data for death investigations. The National Emergency Medical Services Information System (NEMSIS) is the US system that collects, stores, and shares data from EMS systems.[25]

3.1.2.1 Current State: Dataflows with EMS

3.1.2.1.1 IHE Projects

Integrating the Healthcare Enterprise (IHE) publishes "content profiles" that are similar to HL7 IGs in that they define specifications for products and systems that enable standards-based interoperability.[26] NEMSIS is working with IHE to identify and define electronic data elements for improving interoperability of EMS dataflows.[27] Two IHE FHIR profiles involve data important to death investigations:

- IHE PCC - Paramedicine Care Summary (PCS)
- IHE EMS Interoperability Solutions

The draft IHE PCC - Paramedicine Care Summary (PCS)[28] FHIR profile provides the structures and transactions for providing the patient's paramedicine encounter information to the receiving facility.[29] This is being developed under the IHE Patient Care Coordination (PCC) domain. It defines profiles summarized in the following table.

Table 1: Structure Definitions in IHE Paramedicine Care Summary (PCS) (as of 1/2023)

Name (id)	Description	Base and Additions
Paramedicine Care Summary Composition Complete Report	Document for the Paramedicine Care Summary	Composition, derived from Paramedicine Care Summary Composition Clinical Subset. Adds: • Care Team • Paramedicine Note • Physician Certification Statement • Protocols • Transportation Event Observation
Paramedicine Care Summary Composition Clinical Subset	Document for the Paramedicine Care Summary Clinical Subset	Composition, derived from HL7 International Patient Summary Implementation Guide (IPS) Composition (IPS). Adds references and sections for: • Patient (IPS) • Barriers to Care • Chief Complaint • Medication Administered • Procedures Performed • Coverage (insurance) • Physical Exams • Last Known Well Observation • Patient Acuity (initial and final)

[25] NEMSIS, https://nemsis.org/
[26] IHE projects may use https://wiki.ihe.net/ for project-specific notes, whereas HL7 projects use https://confluence.hl7.org/.
[27] IHE, Path to Production https://www.iheusa.org/node/114
[28] IHE, PCC – Paramedicine Care Summary https://build.fhir.org/ig/IHE/PCC.PCS/ & https://github.com/IHE/PCC.PCS/
[29] IHE, Paramedicine Care Summary, https://wiki.ihe.net/index.php/Paramedicine_Care_Summary_(PCS)

Name (id)	Description	Base and Additions
		• Last Oral Intake Observation • Review Of Systems • Mass Casualty Incident section, with entries for Mass Casualty Incident Indicator, Number of Patients, Triage Classification, Disaster Type • Cardiac Arrest Event (Observation/ Procedure/ Condition) • Injury Event Observation • IHE PCS Encounter Clinical Subset
IHE PCS Encounter Complete Report	Defines the full emergency medical transport encounter of a patient.	Encounter, derived from IHE PCS Encounter Clinical Subset. Adds: Transport: Priority, Priority Descriptors, Number of Patients, Transport reason
IHE PCS Encounter Clinical Subset	Defines the emergency medical transport encounter of a patient, with only clinically relevant information.	Encounter. Adds • Locations: Dispatch, Scene, Ambulance, Destination • Service Provider

The draft IHE EMS Interoperability Solutions[30] FHIR profile does not yet define any FHIR artifacts (as of 1/27/2023). It has narrative pages on document sharing (consuming and publishing) and descriptions of two EMS use cases (paramedic care dataflows and routine interfacility patient transport dataflows).

3.1.2.1.2 HL7 Projects and Published Standards

HL7 published standards related to NEMSIS and EMS emergency services (as opposed to emergency departments) include:

- **FHIR**: HL7 FHIR® Implementation Guide: International Patient Summary (IPS), STU 1.1 (2022-11-02)[31]
  - The International Patient Summary (IPS) IG specifies an international electronic health record document containing essential healthcare information about a subject of care. It supports the use case scenario for "unplanned, cross border care."
  - While this IG does not mention EMS or emergency services data, the IHE PCC - Paramedicine Care Summary (PCS) references it. The IHE PCS Paramedicine Care Summary Composition Clinical Subset is a set of constraints on the HL7 IPS Composition.

[30] IHE, EMS-Overview Home https://build.fhir.org/ig/IHE/EMS-Overall/
[31] HL7, IPS IG, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=483 & http://hl7.org/fhir/uv/ips/

- **CDA**: HL7 CDA® R2 Implementation Guide: Emergency Medical Services; Patient Care Report, Release 3.0.1 - US Realm (January 2025)[32]
    - This implementation guide supports the provision of emergency medical service data from provider agencies to hospital emergency departments using the CDA standard. The clinical specifications were developed by the National EMS Information System Technical Assistance Center in collaboration with thirteen professional societies and eight federal partners. This release brings the Patient Care Report into alignment with the NEMSIS 3.5 specification.
- **V3**: HL7 Version 3 Domain Analysis and Domain Information Models
    - Domain Analysis Model: Emergency Medical Services, Release 1 (May 2013) and Domain Information Model; Emergency Medical Services, Release 1 (May 2013)
        - Both the Domain Analysis Model (DAM) and Domain Information Model (DIM) are specific to EMS in the pre-hospital setting. Both were published as informative documents to develop or evaluate American National Standards Institute (ANSI)-approved specifications and standards within the pre-hospital emergency medical services domain.
    - Domain Analysis Model: Trauma Registry Data Submission, Release 1 (July 2014)
        - This DAM represents data elements used in trauma registries. It is based on the registry elements defined by the American College of Surgeons—in collaboration with 20 other professional organizations—in the 2012 National Trauma Data Standard. It defines trauma registry data submission (TRDS) classes that include the class "Pre-Hospital Encounters," which portrays the information pertaining to care provided and observations made by EMS personnel prior to arrival at the submitting hospital facility.

3.1.2.2 Next Steps for Continuing Progress

Next steps for the MDI community: The 2022 report *Data Exchange Practices of Medicolegal Death Investigation*[33] suggests short-term (defined as less than two years) improvements to data exchange from first-responder systems to MDI CMS, including accessing pre-hospital care records/reports in real time from EMS and obtaining appropriate investigative information (e.g., scene investigative reports, medical reports) from first responders. Electronic exchange of EMS/ambulance "run sheets" with such details as administration of naloxone and other medications may be crucial to death investigations. MDI offices may wish to collaborate with local EMS organizations to explore requirements and permissions needed to receive EMS/ambulance run sheets.

Next steps for the MDI FHIR IG project: The FHIR development work of NEMSIS under IHE provides an important opportunity for collaboration.

- Reach out to PCC - Paramedicine Care Summary (PCS) FHIR authors to ask if MDI could be a use case and if the MDI community and MDI CMS vendors may join testing efforts.
- Develop a draft use case for a person declared dead on the scene by EMS, at which point an MDI CMS receives a PCS, just as an electronic health record (EHR) system would if the person were alive and transferred to an emergency department.

[32] HL7, EMS Patient Care Report, https://www.hl7.org/implement/standards/product_brief.cfm?product_id=438
[33] FTCOE, https://forensiccoe.org/private/63da9032991eb

- Discuss with MDI CMS vendors and NEMSIS the information flows, required permissions, and possible technical barriers to the transmission of PCS FHIR artifacts, particularly the Paramedicine Care Summary Composition Complete Report, from EMS to MDI CMS.

3.2 Downstream Users of MDI Data

3.2.1 Organ/Tissue Procurement

The Organization of Scientific Area Committees for Forensic Science (OSAC) report, "Medicolegal Death Investigation Data Commonly Collected and Exchanged" lists organ procurement as a high-value process.[34] Organ Procurement Organizations (OPOs) and the MDI community share a need for timely information on a deceased person for two dataflows:

1. Tissue referrals for transplant or use from a person who dies outside of a hospital setting. (Typically, organ harvesting for transplants is only possible from donors who die in a hospital and on a ventilator.)
2. Permission (signoff) for organ and tissue harvesting from decedent under medicolegal jurisdiction, when the medical examiner bears responsibility to authorize or deny the procurement of organs or tissues on a case-by-case basis.[35] Some states, such as Iowa, legislate the cooperation between MDI offices and OPOs to facilitate anatomical gifts from a decedent whose body is under jurisdiction of the medical examiner.[36] The National Association of Medical Examiners (NAME) states that MDI offices should permit the procurement of organs and tissues in cases falling under their jurisdiction, provided that there are cooperative agreements in place to ensure that MDI offices are able to fulfill their legal mandates regarding determination of cause and manner of death and appropriate collection and preservation of evidence.[37]

The following discussion focuses on data for tissue referrals for transplant or use from a person who dies outside of a hospital setting. Later versions of the MDI FHIR IG may address dataflows for requesting and receiving permissions and signoffs by MDI offices for organ and tissue harvesting. Likewise, later versions of the MDI FHIR IG may provide guidance on triggers for automated initiation of messages, which is important to time-critical information for organ and tissue transplants.

Data needs for organ referrals are better documented than for tissue referrals. In this report, the starting assumption is that many of the data elements for tissue referrals are similar to those for organ donation.

3.2.1.1 Current State: Dataflows with OPOs for Tissue Data Exchange

3.2.1.1.1 Organ Procurement and Transplantation Network (OPTN) and UNet

The Organ Procurement and Transplantation Network (OPTN)[38] collects data related to organ logistics and allocation through collection forms containing more than 3,500 data fields and found in

[34] OSAC, https://www.nist.gov/system/files/documents/2021/07/14/MDI%20data%20commonly%20collected%20and%20exchanged_REFERENCE_07092021_0.pdf
[35] Pinckard (2007), https://www.life-source.org/wp-content/uploads/2020/01/Medical-Examiner-Release-of-Organs-and-Tissues-for-Transplantation.pdf
[36] Revised Uniform Anatomical Gift Act, https://www.legis.iowa.gov/docs/code/142C.4A.pdf
[37] Pinckard (2014), https://name.memberclicks.net/assets/docs/d2701a9a-008f-4502-9fc2-52b0d4f67fc4.pdf
[38] OPTN, Data Collection https://optn.transplant.hrsa.gov/data/about-data/data-collection/

an online application (web portal) called UNet.[39] These forms include the Deceased Donor Registration Worksheet which contains many discrete data elements relevant to the transfer of data from MDI offices.[40] The following table summarizes the data elements used, whether an MDI case management system might be a source of the data, and whether the data element is represented in the MDI FHIR IG. (See also Appendix A – Data Elements Details.)

Table 2: OPTN Data Elements Summary, MDI Office as Source, and Relevant MDI FHIR IG Resource

Data Element	Is MDI Office a Possible Source?	FHIR Resource
Donor Name	Yes	US Core Patient
Donor Date of Birth (DOB)	Yes	US Core Patient
Donor Age	Calculated from DOB	
Donor Sex	Yes	US Core Patient
Donor Residence	Yes	US Core Patient
Donor Ethnicity/Race	Yes	US Core Patient
Donor Citizenship	Unlikely	
Donor Home Country	Unlikely	
Cause of Death	Yes	MDI Cause of Death Part 1 Cause of Death Part 2 (VRDR)
Mechanism of Death	Yes	Injury Incident (VRDR)
Circumstance of Death	Yes	Manner of Death (VRDR)
Medical Examiner/Coroner	Yes	Permission information not in IG
Clinical Information	Yes	Autopsy findings

United Network for Organ Sharing (UNOS) runs UNet as a proprietary web portal for authorized use, providing access to their software and data to approved transplant professionals. It has developed APIs for OPOs and for lab and transplant programs. The use of APIs suggests that data from an MDI CMS using FHIR may be exchangeable with UNet. The UNOS APIs for OPOs include creating and updating death notification registrations (DNRs) and submitting deceased donor registrations (DDRs). The UNOS APIs for transplant programs and histocompatibility labs include submission options for lab data on livers and lungs, as well as unacceptable antigens. Although largely superseded by UNOS, the website for the Health Resources and Services Administration (HRSA) Scientific Registry of Transplant Recipients (SRTR) suggests that organ-specific data are also needed on hearts, intestines, kidneys, and pancreases.[41]

3.2.1.1.2 New England Donor Services (NEDS)

New England Donor Services (NEDS) coordinates organ and tissue referrals among hospitals and ME offices in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, eastern counties of Vermont, and the British Commonwealth territory of Bermuda.[42] In addition to the federally designated OPO, New England Organ Bank (NEOB), NEDS has centralized tissue-donation services operation.

[39] UNOS UNet https://unos.org/technology/unet/
[40] UNOS, DDR Worksheet, https://unos.org/wp-content/uploads/DDR.pdf
[41] HRSA, OPTN/SRTR *2023 Annual Data Report*, https://srtr.transplant.hrsa.gov/adr/adr2023
[42] NEDS, https://neds.org/

NEDS receives direct (electronic) referrals from a few client organizations using MDILog. In addition, NEDS and Yale New Haven Health ran a pilot EHR/OPO data exchange using HL7 V2 Messaging. NEDS is developing a FHIR-based application for Epic. It started with V2 connecting to Epic Bridges (Epic's module for configuring, installing, and maintaining interfaces between the Epic system and other external systems).

The following table summarizes HL7 V2 data elements used by NEDS. The table shows recent mappings of V2 message segments to FHIR provided in the balloted HL7 Version 2 to FHIR IG[43], and whether an MDI CMS might be a source of the data.

Table 3: V2 Message Segments Relevant to Organ and Tissue Procurement and MDI Office as Possible Source

Item	Name	Description	Is MDI Office a Possible Source?	FHIR Resource
PID - Patient Identification segment				
PID-5	Patient Name	Last Name First Name	Yes	US Core Patient
PID-7	Date Time of Birth	DOB	Yes	US Core Patient
PID-8	Administrative Sex	Administrative Sex	Yes	US Core Patient
PID-10	Race	Race/Ethnicity	Yes	US Core Patient
PID-11	Patient Address	Patient Home Zip Code	Yes	US Core Patient
PID-29	Patient Death Date And Time	Date/Time of Death	Yes	Death Date (VRDR)
PV1 - Patient Visit segment				
PV1-3	Assigned Patient Location	Hospital Unit	Yes, if used to record autopsy facility	
PV1-44	Admit Date Time	Admission Date	Yes, if used for arrival at autopsy facility	

3.2.1.1.3 Other Applications Related to Organ/Tissue Referrals

Epic-on-FHIR's Connection Hub lists applications or services that interoperate with the Epic medical record.[44] Several are related to organ and tissue referral and donation dataflows, but their specifications are not publicly available:

- iReferral - automated Donor Referrals to iTransplant (both by InVita Healthcare Technologies[45]): Automates a hospital's referrals of potential organ/tissue donors from Epic directly to OPO's iTransplant EMR System.

[43] HL7, Version 2 to FHIR, https://build.fhir.org/ig/HL7/v2-to-fhir/ & https://build.fhir.org/ig/HL7/v2-to-fhir/ConceptMap-segment-pid-to-patient.html & https://build.fhir.org/ig/HL7/v2-to-fhir/ConceptMap-segment-pv1-to-patient.html

[44] Epic-on-FHIR, https://fhir.epic.com/

[45] InVita, https://www.invitahealth.com/

- Copernicus (LifeLogics, Inc.[46]): A processing engine between a referring organization and an OPO, sending referrals electronically for potential organ and tissue donors.

3.2.1.2 Organ and Tissue Specifications Under Development

1. **FHIR resources**: Several FHIR resources are or will be available for use in future MDI FHIR IG profiles.
    a. Observation.bodySite: The Observation resource uses the body site data element for indicating the site on the subject's body where the observation was made (i.e., the target site). For example, see the Radiation Dose Summary (Observation) profile of the Radiation Dose Summary for Diagnostic Procedures on FHIR draft IG.[47] The base Observation resources uses terminology from Systemized Nomenclature of Medicine (SNOMED) as an example binding for Observation.bodySite.[48] Observation.bodySite might be appropriate for new MDI profiles for findings related to tissue referrals.
    b. BiologicallyDerivedProduct:
        i. R4.0.1 & R4.3.0 (R4B): A material substance originating from a biological entity intended to be transplanted or infused into another (possibly the same) biological entity. (maturity = 0)
        ii. R5.0.0: This resource reflects an instance of a biologically derived product. A material substance originating from a biological entity intended to be transplanted or infused into another (possibly the same) biological entity. (maturity = 2)
    c. Organ Inventory: The Organ Inventory is a candidate (draft) profile on the base Observation intended to provide organ presence and status information (as of November 2022). This candidate profile supports creating a list of organs an individual has or doesn't have and can include "soft" organs, such as hormones, hormone therapy/treatments, etc. The draft includes required binding to SNOMED codes for observed body part. Discussions continue in HL7 (under the Orders and Observations Work Group and the Terminology Infrastructure Work Group) regarding this candidate profile and other options, including using the bodyStructure resource rather than Observation.[49] The bodyStructure resource records "details about the anatomical location of a specimen or body part, including patient information, identifiers, as well as text descriptions and images. It provides for the addition of qualifiers such as laterality and directionality to the anatomic location for those use cases where precoordination of codes is not possible."[50]
    d. Transplant, Transfusion, and Grafts on FHIR:[51] This HL7 project is sponsored by the Orders and Observations Work Group and co-sponsored by the Patient Care Work Group and the Pharmacy Work Group. This project does not appear to have produced any draft or published FHIR resources or documents. Notes from May

[46] LifeLogics, Inc., https://www.lifelogics.org/Products/CopernicusApps
[47] HL7 Radiation Dose Summary, https://build.fhir.org/ig/HL7/fhir-radiation-dose-summary-ig/index.html
[48] HL7 FHIR Value Set Body Site, http://hl7.org/fhir/valueset-body-site.html
[49] HL7, Orders & Observations, https://confluence.hl7.org/display/OO/2022-12-08+Main
[50] HL7, FHIR Resource BodyStructure, http://hl7.org/fhir/bodystructure.html
[51] HL7, Project Summary for Transplant, Transfusion, and Grafts on FHIR, https://www.hl7.org/special/Committees/projman/searchableProjectIndex.cfm?action=edit&ProjectNumber=1370

2022 indicate that the project was subsumed into biological product discussions.[52] The project currently has an end date of May 2026.

2. **Other Resources**:
    a. The Organization of Scientific Area Committees (OSAC) lists "Standard for Interactions Between Medical Examiner, Coroner and all Other MDI Agencies and Organ and Tissue Procurement Organizations and Eye Banks" as under development.[53] Once published, this document may provide new information.
    b. HL7 PHWG project, Anatomical Inventory and Person Characteristics[54], has balloted a logical model, "Anatomical Inventory and Person Characteristics, Edition 1" (May 2025).[55] While this logical model is primarily focused on living patients, it does model donor tissue and organs in the patient.

Recent work on the exchange of organ and tissue data includes development by MDI Connect participants of a local draft IG for sending data from an MDI CMS to donor referral technology that automates the referral process for both hospitals and MDI offices who send to their partnering organ and tissue recovery organizations.

3.2.1.3 Next Steps for Continuing Progress

Next steps for the MDI community: MDI CMS implementers and MDI offices may wish to collaborate with local OPOs to explore requirements, permissions, and technical details for bidirectional exchange of organ and tissue forensic-toxicology data and of electronic permission and sign-off, as well as requirements for triggers.

Next steps for the MDI FHIR IG project:

- Engage with the HL7 PHWG Anatomical Inventory and Person Characteristics project to determine if an anatomical inventory from a postmortem for organ procurement might be a future use case.
- Engage with NEDS to learn about any recent work with FHIR and updates to the V2 data element list used in organ and tissue procurement data exchanges.
- Develop optional MDI value sets (terminology) related to tissue referrals, such as for the checkboxes on the OPTN DDR form.[56]
- Determine the need for (and options for) bidirectional dataflows. Analytical data on removed organs may be important to send back to the MDI CMS.

3.2.2 Fatality Review Teams Reporting to NFR-CRS

The National Fatality Review Case Reporting System (NFR-CRS)[57] is a web-based system used in 47 states by 1300 child-death review teams to better understand how and why children die. These teams include MDI offices and rely on data from MDI investigations and findings. The NFR-CRS is also

[52] HL7, Orders & Observations, https://confluence.hl7.org/display/OO/2022-05-09-13+WGM
[53] NIST, https://www.nist.gov/organization-scientific-area-committees-forensic-science/medicolegal-death-investigation
[54] HL7, Anatomical Inventory and Person Characteristics project, https://www.hl7.org/special/Committees/projman/searchableProjectIndex.cfm?action=edit&ProjectNumber=1851 & https://confluence.hl7.org/spaces/OO/pages/184928725/Anatomical+Inventory+and+Person+Characteristics
[55] HL7, Anatomical Inventory and Person Characteristics logical model, https://confluence.hl7.org/download/attachments/325465191/HL7_LM_AIPC_E1_I1_2025MAY.pdf?version=1&modificationDate=1744898322572&api=v2
[56] UNOS, DDR Worksheet, https://unos.org/wp-content/uploads/DDR.pdf
[57] NCFRP, NFR-CRS, https://data.ncfrp.org/

used to gather data for the CDC's Sudden Unexpected Infant Death (SUID) and Sudden Death in the Young (SDY) Case Registry,[58] so improvements in dataflows from MDI offices into the NFR-CRS support multiple public-health efforts.

The Michigan Public Health Institute (MPHI) Center for National Prevention Initiatives (CNPI) houses the National Center for Fatality Review and Prevention (NCFRP) and the Center for Technology Solutions (CTS), which, together, support fatality review teams' technical needs. MPHI houses the NFR-CRS and CDC provides funding support for these endeavors.

While MDI offices provide information for the NFR-CRS, data entry is often manual, even for data elements that do not require interpretation or deidentification, which increases the workload of state fatality review teams.

3.2.2.1 Current State: Dataflows for NFR-CRS

Information gathered from MPHI and its CTS on current dataflows for the NFR-CRS indicates that data from MDI offices to the NFR-CRS vary widely among jurisdictions in terms of both data elements and flows. There are approximately 1600 fatality-review teams, including child death review (CDR) teams, throughout the US, and they all capture and transmit data differently.

Many cases start with child protective services (CPS) bringing a case to the local or state CDR team, which then submits information to NFR-CRS. CDR teams and EDRS staff also review death certificates to identify cases.

CDR teams use a broad spectrum of case record abstraction practices, both on-site and through a web-based portal. Some abstractors (state fatality review staff) access the MDI CMS; others obtain information verbally from MDI offices. The data often require manual review and manual transfer by the abstractors (fatality review staff).

Most users enter data into NFR-CRS manually on the web portal. MPHI has developed a flat-file entry system with a CSV file template, as well as directions and acceptable data format for the import process, that states can complete and submit. Ten to twelve states currently use the flat-file upload process. The template contains a limited set of data fields (primarily vital-record information) and requires an exact format match. Typically, one or two death -review team members in each state have authorization to submit files. Those individuals get information from the MDI office (and other sources), put together the flat file, and submit it. States are responsible for obtaining the information required by the flat file. The following table summarizes the data elements MDI offices can upload to the MPHI system. The table shows the data elements used, whether an MDI case management system might be a source of the data, and whether the data element is represented in the MDI FHIR IG. (See also Appendix A – Data Elements Details.)

Table 4: Summary of MPHI Flat File Import Template Data Fields for CDR Report Form[59]

Field Topic	Is MDI Office a Possible Source?	FHIR Resource
Case Definition - Death Cert #	No	
Case Definition - Birth Cert #	Unlikely	
Case Definition - ME/Coroner #	Yes	Death Certification Procedure (VRDR)
Section A – Child Information		

[58] CDC, SUID and SDY Case Registry, https://www.cdc.gov/sudden-infant-death/php/case-registry/index.html
[59] NCFRP, CDR Report Form, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/CDR_NFR-CRS_v6-2.pdf

A1 - Child's Name	Yes	US Core Patient
A2 - Child's Date of Birth	Yes	US Core Patient
A3 - Child's Date of Death	Yes	Death Date (VRDR)
A4 - Child's Age	Yes	US Core Patient
A5 - Child's Race	Yes	US Core Patient
A6 - Was Child Hispanic or Latino/a	Yes	US Core Patient
A7 - Child's Sex	Yes	US Core Patient
A8 - Child's Address	Yes	US Core Patient
A11 - State of Death	Yes	Death Location (VRDR)
A12 - County of Death	Yes	Death Location (VRDR)
A27 - Education of Child only CDR non-infants	Unlikely	
A44 - Gestational Age in weeks	No	
A45 - Birth weight in grams	No	
A46 - Was this a multiple gestation pregnancy?	No	
A49 - Not including the deceased infant, the number of children the childbearing parent still has living.	No	
A50 - Prenatal care provided to childbearing parent?	No	
A52/94 - Childbearing parent had medical complications	No	
A61/62 - Smoke during pregnancy	No	
A66 - Infant ever breastfed?	No	
Section E – Incident Information		
E1 - Date of incident	Yes	Injury Incident (VRDR)
E2 - Time of incident	Yes	Injury Incident (VRDR)
E5 - Incident state	Yes	Injury Location (VRDR)
E6 - Incident county	Yes	Injury Location (VRDR)
Section F – Investigation Information		
F5 - Was an Autopsy performed	Yes	Autopsy Performed Indicator (VRDR)
F8 - Was a Tox screen positive for Alcohol	Yes	
F8 - Was a Tox screen positive for Cocaine	Yes	
F8 - Was a Tox screen positive for Marijuana	Yes	
F8 - Was a Tox screen positive for Opioids	Yes	
Section G – Official Manner and Cause of Death		
G1 - Cause of Death Code	No, because requires ICD-10 code	
G2 - Immediate cause	Yes	MDI Cause of Death Part 1
G2 - Cond	Yes	Cause of Death Part 2 (VRDR)
G3 - Other Cond	Yes	Cause of Death Part 2 (VRDR)

G4 - If injury, how injury occurred	Yes	Injury Incident (VRDR)
G5 - Manner of Death	Yes	Manner of Death (VRDR)

MPHI has developed an API for use in their Indiana integration project. It uses Salesforce for case creation, data entry, and updating with a goal of reducing double data entry. The API creates a case and updates individual sections of that case within the NFR-CRS, using all the logic and rules of NFR-CRS. The API has built-in data validation and skip patterns just as NFR-CRS does. Overall, the flow of data from the Indiana Salesforce application via API to the NFR-CRS has been successful with very few problems noted regarding data transmission. Indiana is currently working to make the Salesforce application congruent with Version 6.2 of the NFR-CRS. This process is resource-intense work, which may be a concern for other states who may want to replicate this model. Users of the API are mostly Indiana state staff and CPS workers. The data entry into Salesforce is manual.

MPHI does not have access to the Indiana data sources in the Salesforce database but sees only the data that are exchanged with NFR-CRS. Indiana CPS workers input information to Salesforce after initial notification of death and age criteria flag a case for their management. It is likely that MDI information is the source for the CPS workers. The API does not accept imports from the EDRS. The API import form mimics individual pages of the PDF forms and is based on the code book or spreadsheet versions of:

- Child Death Review (CDR) NFR-CRS Form v6.2[60]
- Fetal and Infant Mortality Review (FIMR) NFR-CRS Form v6.2[61]
- NFR-CRS: Data Dictionary v6.2[62]

3.2.2.2 *Desired Near-Future State*

The goals of modernization and electronic transfer of information are to retain data integrity and consistency, provide improved access to information, and to reduce burden for both MDI offices and death-review teams.

The flat file provides a starting point to further automating data entry. For example, the flat-file fields could be partially pre-populated directly from an MDI CMS export, streamlining further data entry. Transformation tools ("transforms") could change the FHIR resources coming from MDI CMS.

As mentioned above, the flat file template contains a limited set of data fields. Additional fields noted by MPHI staff as candidates for electronic import from MDI CMS are:

- F3 - Was a death investigation conducted
- F3 - Death referred to
- F4 - Person declaring cause and manner
- F6 - Autopsy assessment
- F7 - Other testing

[60] NCFRP, CDR Report Form, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/CDR_NFR-CRS_v6-2.pdf
[61] NCFRP, FIMR Report Form, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/FIMR_NFR-CRS_v6-2.pdf
[62] NCFRP, Data Dictionary, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/DataDictionary_CRS_v6-2.pdf

- F8 - Other substances found on toxicology testing
- F10 - Abnormalities noted in autopsy

The question of what would make data acquisition from MDI CMS flow more easily and accurately for fatality review teams is complex and multi-tiered. Some MDI data can be easily automated because they do not need interpretation (that is, the MDI data can be used "as is"). These data should be identified for high-priority addition to the MDI FHIR IG. Other MDI data require interpretation by data abstractors. Initially, these may be best handled as narrative blocks that could be searched via data queries or other types of machine learning.

Although the focus of this section is on child-death reviews, MPHI maintains a wider scope of reporting systems. Information needed by their other systems may help to define a core set of data requested from MDI offices.

A messaging system within the MDI CMS that would flag a case for possible child-death review when certain criteria are met might improve the dataflow.

One goal of the overall modernization effort is for the data coming from MDI offices to have the structure and format that supports easy transmission along the whole dataflow, from MDI office to the state team to the NFR-CRS database.

3.2.2.3 *Technical Details, Barriers, Opportunities*

One technical challenge to receiving electronic data from an MDI CMS is the number of data-use agreements (DUA) that need to be maintained with over 70 jurisdictions at the state and county levels. The DUAs use broad language and indicate that the data are owned by the state. These agreements may need to be changed individually for new technology such as FHIR data exchange. Changing DUAs may be difficult and is a time-intensive process. However, not all situations require DUAs. For example, the flat-file submissions do not require a format-specific DUA. They are submitted to the national system by the state team and users need to have administrative permissions to upload the flat file.

MPHI has relationships with state entities that may be excited about the opportunity to work with them towards modernizing data acquisition for NFR-CRS.

3.2.2.4 *Next Steps for Continuing Progress*

Next steps for the MDI community: MDI CMS implementers may wish to:

- Explore requirements for adding triggers/decisions to notify downstream recipients.
- Explore an export format that conforms to the flat file for CDR.

Next steps for the MDI FHIR IG project:

- Explore the Indiana API as a model for future MDI FHIR IG development.
- Assess the NFR-CRS data dictionary and reporting forms (versions 6.2) for new MDI data elements or changes to current data elements.

3.2.3 Violent Death Reporting to NVDRS

The National Violent Death Reporting System (NVDRS) is a national database of state-submitted data, pooled from multiple sources.[63] The database tracks over 600 data elements per anonymized case.

[63] CDC, NVDRS, https://www.cdc.gov/nvdrs/about/index.html

3.2.3.1 Current State: Dataflows for NVDRS

Medical examiners and coroners provide data on violent deaths to a state's recipient organization, designated by NVDRS. (Each state has one grantee, except New York, which has two.) States house their violent-death reporting programs in a wide variety of recipient organizations, ranging from a state's medical examiner's office to a hosting university. (Note that the SUDORS' recipient may or may not be the same organization as the state's recipient.)

Within the recipient organization, the state's violent-death reporting program assembles the data for each violent-death case from multiple sources. In addition to MDI offices, data are collected from death certificates, law-enforcement reports, child-death review teams, crime labs, and hospitals. As with fatality review teams, abstractors are often key to gathering data from disparate source systems and in a variety of forms, such as PDF reports.

The state's violent-death reporting program staff review and research conflicting information from the various sources and then anonymize the case before submitting it to the NVDRS. Thus, the NVDRS staff do not see the dataflow mechanisms from MDI offices and other sources to the state program.

NVDRS has a bulk-upload system for the state programs. A portion of that targets the types of information coming from MDI offices. Recipient organizations use the bulk-upload file to put together data from their sources, but MDI offices and other sources rarely use it.

The following table summarizes categories of NVDRS data, whether an MDI case management system might be a source of the data, and whether an MDI FHIR IG profile may represent some of the data elements in the category. Data topics for which MDI offices may be a source that do not have a corresponding MDI FHIR IG Resource may be priorities for new MDI FHIR profiles. (See also Appendix A – Data Elements Details.)

Table 5: NVDRS Data Categories, MDI Office as Source, and Relevant MDI FHIR IG Resource[64]

NVDRS Data Topic	Is MDI Office a Possible Source?	FHIR Resource
Case Status	---	
Incident narrative	Yes	
Document tracking	---	
Person type	Yes	
Name, zip code, county	Yes	US Core Patient
Age/sex/race/ethnicity	Yes	US Core Patient
When and where (injury/death)	Yes	Composition - MDI and EDRS
Type of medical treatment	---	
Cause of death ICD-10- code(s)	---	
External injury ICD-9-CM	---	
Manner of death	Yes	Manner of Death (VRDR)
Additional person descriptors	Yes	
Alcohol and drug tests	Yes	Diagnostic Report - Toxicology Lab Result to MDI
Wounds	Yes	
Circumstances	Yes	

[64] CDC, NVDRS Web Coding Manual Version 6.1, https://www.cdc.gov/nvdrs/media/pdfs/2025/03/nvdrs-coding-manual-version-6.1_508.pdf (18-19)

NVDRS Data Topic	Is MDI Office a Possible Source?	FHIR Resource
Victim-suspect relationship	Yes	
History of victim abuse	Yes	
Suspect was victim caretaker	Yes	
Weapon type	Yes	
Firearm descriptors	Yes	
Poison details	Yes	Diagnostic Report - Toxicology Lab Result to MDI

3.2.3.2 Desired Near-Future State

Some data specified in the NVDRS Coding Manual Table (2021), such as the wound fields, are good candidates for transmitting as structured data (number and location of penetrating wounds, number of bullets that struck the victim, etc.) if they exist in distinct fields within the MDI CMS.

Toxicology data are a high priority. Toxicology information largely goes into NVDRS by abstractors reviewing electronic information and rekeying the data. Drug names of the drugs may vary between systems and abstractors may have to manually map between synonyms. Automating the mapping may improve data quality and flows. The Department of Transportation (DOT) is also interested in toxicology,[65] as is the Drug Enforcement Agency (DEA) for the National Forensic Laboratory Information System (NFLIS),[66,67] so there may be collaborative opportunities among agencies.

How electronic data systems manage rapidly changing substance lists (and novel or unknown substances) is another important topic for collaboration.

3.2.3.3 Technical Details, Barriers, Opportunities

Two opportunities for future discussions may be with states that currently use the bulk-data upload system and states where the violent-death reporting system (VDRS) program is embedded in the state's medical examiner's office.

Recent work on the exchange of violent death data includes GTRI's development of:

- A flat file generation mechanism for the current NVDRS submission mechanism.
- The draft Violent Death and Overdose Reporting (VDOR) FHIR IG[68], which uses NVDRS data elements as a starting point for terminology alignment to support violent death and overdose reporting dataflows for both MDI CMS and law enforcement. Artifacts developed in the VDOR IG may be moved to the MDI FHIR IG as they are tested and gain maturity.

3.2.3.4 Next Steps for Continuing Progress

Next steps for the MDI community: The MDI community may wish to:

- Prioritize data topics in Table 5 for which MDI offices may be a source and which have no corresponding MDI FHIR IG resource.
- Identify states that use the bulk-data upload system.
- Identify states where the review program is embedded in the MDI office.

[65] NHTSA, FARS, https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars
[66] NFLIS-MEC, https://www.nflis.deadiversion.usdoj.gov/mec.xhtml
[67] NFLIS-TOX, https://www.nflis.deadiversion.usdoj.gov/tox.xhtml
[68] VDOR FHIR IG, https://build.fhir.org/ig/HL7/fhir-vdor/

Next steps for the MDI FHIR IG project:

- Review the draft Violent Death and Overdose Reporting (VDOR) FHIR IG, for artifacts to move into the MDI FHIR IG as they are tested and gain maturity.
- Develop additional FHIR profiles for high-priority data topics in Table 5 for which MDI offices may be a source and which have no corresponding MDI FHIR IG resource and map NVDRS data elements to FHIR resources, based on List of Variables Collected in NVDRS/SUDORS system as of 5/2021.[69]

3.2.4 Drug Overdose Reporting

Two downstream users of drug overdose data are CDC's State Unintentional Drug Overdose Reporting System (SUDORS) and Overdose Detection Mapping Application Program (ODMAP)[70], which is used by some jurisdictions for public health and safety. The ODMAP software links MDI CMS and other relevant record management systems to a mapping tool.

SUDORS is a national database of jurisdiction-submitted data on drug-overdose deaths, collected and abstracted from death certificates and MDI office reports.[71] Each of the 48 funded jurisdictions enter data into a web-based CDC platform that is shared with the NVDRS.

3.2.4.1 Current State: Dataflows for SUDORS

The workflow of MDI-related data for the SUDORS system is:

1. Primary data source:
    a. MDI office, including scene investigators and autopsy staff
    b. Hospital EHRs (for medical history)
    c. Law enforcement reports
    d. Forensic toxicology laboratory reports (postmortem toxicology)
    e. EMS data from EMS provider
2. MDI CMS
3. State/jurisdictional SUDORS team
4. NVDRS/SUDORS web portal

The data included in the step 2-to-3 exchange are as detailed as possible. These data are personally identifiable and allow the state/jurisdictional SUDORS team to compare information from several sources and track down additional information. These detailed data provide the basis for the de-identified data that are entered into the web-based system, including the MDI narrative that the state/jurisdictional SUDORS team creates and submits to SUDORS via the step 3-4 exchange.

The death certificate data from EDRS to SUDORS follow a similar workflow:

1. Primary sources (MDI office, funeral home, etc.)
2. State EDRS/Vital Records Office
3. State/jurisdictional SUDORS team
4. NVDRS/SUDORS web portal

In both workflows, the detailed data arriving at the state/jurisdictional SUDORS team provide the basis for the de-identified data that are entered into the national NVDRS/SUDORS web portal,

[69] NVDRS, List of Variables Collected, https://omb.report/icr/202112-0920-012/doc/117884100
[70] ODMAP, https://www.odmap.org/
[71] CDC, SUDORS https://www.cdc.gov/overdose-prevention/data-research/facts-stats/about-sudors.html

including the MDI narrative that the state/jurisdictional SUDORS team creates and submits to SUDORS.

State/jurisdictional SUDORS teams, generally housed in a state's department of health, are key to the dataflow. Staff abstractors review death certificates, assess which cases meet the case definition for unintentional and undetermined-intent drug overdose,[72, 73] gather additional relevant information from MDI offices (and other sources), write case summaries, and ensure that each complete case data set is anonymized (i.e., does not contain individually identifiable information) before uploading to the national SUDORS system. A SUDORS team identifies cases based on information provided on the death certificates and MDI office reports, using ICD-10 cause-of-death codes and cause-of-death information in the MDI office report.

Terminology: The Overdose Mortality Team maintains a frequently updated list of substances, rather than relying on SNOMED or other code systems.

Importing files: State/jurisdictional SUDORS teams have the option to import the death certificate data to SUDORS via a flat file. A few states/jurisdictions have an import feature for MDI offices to submit data to the state/jurisdictional SUDORS team. The SUDORS Data Dictionary reviewed in 2023 includes 1224 data fields tagged with sections and tabs (with some fields having none, [blank]). Of these, 138 fields are named "CME_ …" (i.e., coroner/medical examiner), all in the Victim section on the Circumstances tab. Many more fields than that may rely on MDI offices as the primary data source. The following table summarizes the data elements count in each section-and-tab combination, based on the SUDORS Data Dictionary System variables, provided by CDC in 2023.

Table 6: SUDORS Data Dictionary Field Counts

	SUDORS sections						
SUDORS tab	**Incident**	**OD**	**Toxicology**	**Victim**	**Weapon**	**[blank]**	***Total count***
Circumstances	---	---	---	276	---	---	***276***
Demographics	---	---	---	58	---	---	***58***
Incident Overview	15	4	---	---	---	---	***19***
Injury and Death	---	---	---	69	---	10	***79***
Overdose (OD)	---	200	---	---	---	---	***200***
Toxicology	---	---	13	52	---	---	***65***
Weapon(s)	---	---	---	---	5	---	***5***
[blank]	69	7	7	412	27	---	***522***
Total count	***84***	***211***	***20***	***867***	***32***	***10***	***1224***

[72] CDC, SUDORS Dashboard, "Important Data Considerations" (https://www.cdc.gov/overdose-prevention/data-research/facts-stats/sudors-dashboard-fatal-overdose-data.html) notes that "the Injury Surveillance Workgroup 7 consensus definition of a drug is used to determine SUDORS case."
[73] CDC, SUDORS, Injury Surveillance Workgroup 7, https://cdn.ymaws.com/www.safestates.org/resource/resmgr/imported/ISW7%20Full%20Report_3.pdf

3.2.4.2 Desired Near-Future State

SUDORS uses the same import template and guidance as NVDRS when uploading to the CDC web portal. However, work is being done to add additional fields that are specific to a tab within the system that captures specific information on SUDORS cases.

MDI data for SUDORS can include scene findings, autopsy reports, and full postmortem toxicology findings. Important data include:[74]

- History of prior overdoses
- Treatment for substance use disorder
- Prescription drug misuse or illicit drug use history
- Routes of drug administration (e.g., injection, smoking)
- Presence of bystanders
- Naloxone administration
- All drugs detected
- Drugs contributing to death
- Date specimens were collected

These data concepts are good candidates for transmitting as structured data if they exist in distinct fields within the MDI CMS.

Additional data that the state/jurisdictional SUDORS teams likely want are:

- Death investigation narrative notes
- Autopsy structured data and narrative(s)
- EMS "run sheets," especially fields indicating naloxone administered and/or other lifesaving procedures attempted; and witness interviews
- Hospital emergency department (ED) toxicology test results

As with MDI data for NVDRS, including toxicology data for SUDORS is a very high priority. Reviewing details of SUDORS data elements (Data Dictionary) will inform future development of the MDI FHIR IG. The current import from MDI offices may include only the toxicology summary and conclusions, whereas electronic exchange of data on presence and levels of individual substances will be valuable and reduce data re-entry workload.

Reviewing both a sample MDI report and a state-to-SUDORS submission form will be useful in helping determining priorities for additional FHIR resources.

The MDI FHIR IG should include guidance to implementers about creating an output format that aligns with the submission form/flat-file structures and expected fields.

3.2.4.3 Technical Details, Barriers, Opportunities

Collaborating with those state/jurisdiction SUDORS teams that use an import feature for MDI offices to submit data may provide an opportunity both for pinpointing high-priority structured data elements coming from MDI offices and for providing guidance to MDI CMS vendors on transform tools needed.

[74] CDC, SUDORS Fact Sheet https://www.cdc.gov/overdose-prevention/media/pdfs/2024/04/SUDORS-Fact-Sheet.pdf

Most state/jurisdictional SUDORS teams are housed in the state's department of health, but there are a few exceptions where some academic organizations are partnering with the state health department. These might provide additional opportunities for collaboration on system-wide technology improvements.

Recent work on the exchange of drug overdose data includes:

- GTRI's development of the draft Violent Death and Overdose Reporting (VDOR) FHIR Implementation Guide (see description above) will support reporting to SUDORS as well as NVDRS.
- An MDI CMS vendor participating in the MDI Connect program developed FHIR resources and API to submit data to ODMAP.

3.2.4.4 Next Steps for Continuing Progress

Next steps for the MDI community: MDI offices may wish to identify the subset of SUDORS Data Dictionary fields that typically come from MDI offices to state SUDORS teams.

Next steps for the MDI FHIR IG project:

- Review a current SUDORS Data Dictionary file (more recent than 2023) for fields that may rely on MDI offices as the primary data source.
- Clarify the information that is being received from toxicology, including substance list and details on substance levels for possible terminology reference in the MDI FHIR IG.
- Map the SUDORS subset identified by the MDI community to current MDI FHIR IG resources and identify new FHIR resources to develop.

3.3 Data Exchanges for Review

In addition to collecting and disbursing death investigation data (i.e., upstream and downstream MDI dataflows) MDI offices also receive requests to review death data. For example, death certificate information may require a review by an MDI office for death data quality improvement or for clearance to cremate the decedent.

3.3.1 Current State: Dataflows for Review Purposes

A death certificate sent for review may or may not be certified by the receiving MDI CMS and may or may not have a corresponding case record in the MDI CMS. The death certificate may require MDI office review for several reasons, including:

- **Death Data Quality Improvement:** An EDRS may request review of a death certificate by an MDI office to improve the quality and completeness of death reporting. Such a review may be triggered if areas of the death certificate appear to be incomplete or inconsistent, for example a required field was left blank or data provided is not appropriate or is out-of-range. A review might also be required by law or policy for deaths within a given jurisdiction and meeting specific criteria.
- **Cremation Clearance** (also known as "cremation authorization"): Many states and jurisdictions require cremation clearance from an MDI office to make sure physical evidence is not needed for any further inquiries into the death. The rules about when cremation clearance is required vary among jurisdictions, but typically it is needed when cause and manner of death information for the death certificate is provided by an attending physician or other provider, rather than the jurisdiction's medical examiner or coroner.

The MDI FHIR IG STU 2 includes the following FHIR Messaging structure for transmission of death certificate information to be reviewed and for its returned response (i.e., bidirectional exchange):

- **Bundle - Message Death Certificate Review**: includes an optional Bundle.identifier (persistent identifier for the message bundle)
    - **MessageHeader - Death Certificate Review**: includes MessageHeader.reason (ex: Cremation Clearance Request)
    - **Bundle - Document Death Certificate Review**: includes a required Bundle.identifier (persistent identifier for the document bundle)
        - **Composition - Death Certificate Review**: includes information on:
            - Tracking numbers
            - Death Certificate workflow status
            - Cremation Clearance status and authorizer information
            - Death Certificate data for review (DecedentDemographics, DeathInvestigation, DeathCertification, DecedentDisposition)
            - Death Certificate Data Review results section for MDI office assessments
            - Cremation Clearance information section

Data Quality Improvement Use Case Steps:

1. EDRS sends the death certificate to MDI CMS for review.
2. Medical examiner / coroner reviews death certificate information, particularly the cause and manner of death.
3. MDI CMS sends response with additional information in the Death Certificate Data Review results section of a return Bundle - Message Death Certificate Review. The original or updated death certificate structured data sections (DecedentDemographics, DeathInvestigation, DeathCertification, DecedentDisposition) may be included in the return Bundle - Message Death Certificate Review.

Cremation Clearance Use Case Steps - The cremation clearance workflow starts after the death certificate is largely complete. A typical workflow, at a high level, includes:

1. Next of kin (or other authorized person or organization) requests cremation be the method of disposal and signs a cremation clearance request (CCR).
2. Funeral home provides death certificate information and submits the CCR to the jurisdiction's vital records office (VRO) EDRS.
3. EDRS sends the CCR with the death certificate to MDI CMS for review.
4. Medical examiner / coroner reviews death certificate information, particularly the cause and manner of death, and makes a determination.
5. MDI CMS sends to EDRS a cremation clearance authorization document with the status of the request in the Cremation Clearance information section of a return Bundle - Message Death Certificate Review. The original death certificate structured data sections (DecedentDemographics, DeathInvestigation, DeathCertification, DecedentDisposition) may be included in the return Bundle - Message Death Certificate Review.

This guide does not define FHIR resources for other aspects of the cremation clearance workflow, such as fee payment.

3.3.2 Desired Near-Future State

Participants in the MDI Connect program have tested a cremation clearance dataflow between a funeral home and an MDI CMS. As MDI offices continue to test this flow, the MDI community may want additional data elements for the cremation clearance forms and for supporting data exchange between MDI CMS and funeral homes.

3.3.3 Technical Details, Barriers, Opportunities

None noted.

3.3.4 Next Steps for Continuing Progress

Next steps for the MDI community:

- Test more cases of death certificate review for death data quality improvement and for cremation clearance to surface new data elements that need definition.
- Discuss and describe other uses cases of death certificate review by an MDI (besides for death data quality improvement and cremation clearance) that might require additional FHIR resources.

Next steps for the MDI FHIR IG project: None noted.

4 Standardizing Terminology for Death Investigation Data

Standardizing terminology for death investigation data is a challenge that cuts across many MDI dataflows. Exchange of structured data between systems and organizations relies on well-defined and agreed upon codes to convey meaning and maintain semantics.

4.1 Terminology Overview

"Terminology" refers to the vocabulary of codes with defined meaning, which are cited in data exchange standards. Codes are organized into code systems in which the code and the definition are linked together. Value sets are collections of codes assembled for specific needs, which may contain codes from several code systems.

- Example of code systems relevant to MDI data: SNOMED[75]
- Example of value sets relevant to MDI data: HL7 value set, "SNOMED CT Body Structures"[76], which are codes describing anatomical locations. This value set is used in Specimen.collection.bodySite (binding = example)

Organizations involved in death investigations may use their own in-house (locally defined) codes or they may use widely agreed upon codes. The advantage of using widely agreed upon codes is that precise meaning is maintained when exchanging data with other organizations or systems.

A "terminology server" is a host computer that stores a database of codes and/or value sets, which provides centralized management and allows remote access by authorized users. Example of a terminology server relevant to MDI data: SNOMED CT Browser[77]. The terminology server stores the widely agreed upon codes in a centralized location that is up-to-date and well maintained. Terminology servers with API access can speed sharing accurate information such as toxicology terms. This is particularly important when new codes are being added frequently in a rapidly evolving field of knowledge, such as toxicology.

4.2 Challenges and Opportunities in Forensic Toxicology Terminology

Forensic toxicology, the analysis of biological samples for the presence of toxins, encompasses a rapidly expanding set of chemical substances, including:

- Legally manufactured chemicals, including pharmaceutical drugs
- Illegally manufactured drugs
- Metabolites and breakdown products

A forensic toxicology report can provide key information on the type of substances present in an individual and if the amount of those substances is consistent with a therapeutic dosage or is above a harmful level.[78] The work of MDI offices conducting death investigations includes taking postmortem specimens for forensic toxicology analysis to determine the drugs involved in fatal drug overdose. This analysis includes determining the role of a chemical substance (e.g., pharmaceutical drugs or illegally manufactured substance) by the presence of metabolites and breakdown products in the body. MDI offices use these results to determine cause of death.

[75] SNOMED, https://www.snomed.org/
[76] HL7, SNOMED CT Body Structures, http://hl7.org/fhir/R4/valueset-body-site.html
[77] SNOMED CT Browse5r, https://browser.ihtsdotools.org/?
[78] NIJ, Forensic Toxicology, https://nij.ojp.gov/topics/forensics/forensic-toxicology

4.2.1 Challenges

Terminology poses a significant challenge to the exchange of accurate forensic toxicology data between organizations and systems because of the vast and rapidly increasing list of potential terms (codes and definitions). Emerging illegal drugs are often reported from toxicology labs using a variety of non-standard naming conventions. Often the names are related to laws or scheduling for that locality. Over the past decade, there has been an explosion in the number of new illicitly manufactured drugs, starting with fentanyl. More recently, cannabinoids and other synthetic drugs are increasingly involved in death. Often, these are illegally manufactured substances with no legitimate medicinal purpose, so are not documented in existing pharmaceutical databases.

Currently many offices are creating and maintaining their own mappings between terms which is redundant work and potentially leads to errors.

4.2.2 Opportunities

Developing a terminology system to allow the forensic community and other relevant partners to determine which drugs are the same (synonyms) and the relationships between drugs (e.g., metabolite, precursor, analogs), will benefit the forensic community. Creating a community of practice around term mapping will take away the onus of maintaining mappings from each office and will allow an easier exchange of information about a particular drug between offices. The benefit will extend to those who use the data produced by the forensic toxicology labs, including public health and public safety.

Having such a system will allow public health tracking of the impact of a particular drug (or drug class) on society. For instance, to track the number of deaths, drug seizures, law enforcement actions, or prosecutions, it is critical to have the drugs represented in a similar way. In addition, this system would allow for cross-disciplinary discussions.

MDI data modernization will be greatly enhanced by supporting forensic toxicology labs and MDI offices in adoption of standard ways to capture and share information about legal and illegal substances, their makeup, and their metabolites and breakdown products. Stakeholders that likely share an interest in standardizing forensic toxicology terminology include:

- Council of State and Territorial Epidemiologists (CSTE)
- Center for Forensic Science Research & Education (CFSRE), Novel Psychoactive Substances (NPS) Discovery program, an open-access drug early warning system in the US[79]
- NFLIS: National Forensic Laboratory Information System (US Dept. Justice) surveillance by voluntary surveys:
    - NFLIS-MEC: drug-related mortality data from medical examiner and coroner offices
    - NFLIS-Tox: drug testing results from toxicology laboratories
    - NFLIS-Drug: data from drug cases submitted to and analyzed by the Nation's forensic laboratories
- NHTSA: National Highway Traffic Safety Administration
    - Fatality Analysis Reporting System (FARS): nationwide census providing yearly data on fatal injuries suffered in motor vehicle traffic crashes.

4.2.3 Toxicology Terminology Activities

- **GSRS**: Global Substance Registration System[80]

[79] CFSRE & NPS Discovery, https://www.cfsre.org/nps-discovery/

[80] GSRS, https://gsrs.ncats.nih.gov/ & GSRS ver. 3.1.1, https://gsrs.ncats.nih.gov/ginas/app/ui/home

    - A collaboration between the Food & Drug Administration (FDA), NIH's National Center for Advancing Translational Sciences (NCATS), and partners including the European Medicines Agency (EMA), US Pharmacopeia (USP), World Health Organization (WHO), Uppsala Monitoring Centre (UMC), and Germany's Federal Institute for Drugs and Medical Devices (Bundesinstitut für Arzneimittel und Medizinprodukte, BfArM).
    - Defines substances by standardized, scientific descriptions focusing on ingredients and classifying them as chemical, protein, nucleic acid, polymer, structurally diverse, or mixture, following the guidelines of ISO 11238 and ISO DTS 19844.
    - Publicly accessible resource for researchers, regulators, and industry professionals.
- **NIH**: National Institutes of Health
    - NCATS: National Center for Advancing Translational Sciences — Inxight Drugs[81], a portal for drug development information (US approved, marketed, and investigational).
    - RxNorm[82] — Normalized names for clinical drugs. Links names to common drug vocabularies used in pharmacy management and drug interaction software to mediate messages between systems not using the same software and vocabulary.
    - Value Set Authority Center (VSAC)[83] & Public Health Information Network Vocabulary Access and Distribution System (PHIN VADS)[84] — VSAC and PHIN VADS rely on existing codes and are not as flexible as Observational Medical Outcomes Partnership (OMOP) for defining relationships.
- **OHDSI**: Observational Health Data Sciences and Informatics
    - OHDSI Standardized Vocabularies[85]
    - Observational Medical Outcomes Partnership (OMOP), Common Data Model (CDM)[86] & FHIR to OMOP FHIR IG[87]
    - Athena: OHDSI Vocabularies Repository[88] by Odysseus Data Services, Inc. contains codes from many code systems, including RxNorm, OMOP, etc.
- **GTRI:** Proof-of-concept terminology server to fill the role of a forensic toxicology terminology server, which maps NVDRS terminology to OMOP using Athena database.
- **CDC:** NVDRS & SUDORS use an in-house system to group like terms based on the expertise of a forensic toxicologist.
- **HL7:** Terminology Services Management Group (TSMG)[89], which oversees HL7 Terminology (THO)[90]. This is an example of a freely accessible, web-based browsable source of code systems and value sets. It contains terminology cited in HL7 published artifacts. Currently, the resources related to drugs focus on primarily on pharmaceuticals (legally manufactured drugs), rather than illicit drugs or metabolites and breakdown products.

[81] NIH, Inxight Drugs, https://drugs.ncats.io/
[82] NIH, RxNorm, https://www.nlm.nih.gov/research/umls/rxnorm/index.html & RxNav browser, https://lhncbc.nlm.nih.gov/RxNav/applications/RxNavDoc.html
[83] NIH, VSAC, https://vsac.nlm.nih.gov/
[84] NIH, PHIN VADS, https://phinvads.cdc.gov/vads/SearchVocab.action
[85] OHDSI, Standardized Vocabularies, https://github.com/OHDSI/Vocabulary-v5.0/wiki
[86] OMOP, CDM, https://www.ohdsi.org/data-standardization/
[87] HL7, FHIR to OMOP FHIR IG, https://build.fhir.org/ig/HL7/fhir-omop-ig/
[88] Athena, OHDSI Vocabularies Repository, https://athena.ohdsi.org/search-terms/start
[89] HL7, TSMG, https://confluence.hl7.org/spaces/TSMG/overview
[90] HL7 THO, https://build.fhir.org/ig/HL7/UTG/index.html

5 Summary of MDI FHIR IG Next Steps

This document contains next steps that NCHS may wish include in the MDI FHIR IG project and may wish to bring to the MDI community, which includes death investigators (such as medical examiners and coroners), MDI CMS developers and implementers, and other government agencies with an interest in dataflow modernization, such as the CDC's COMEC.

Next Steps for NCHS to Consider Discussing with the MDI Community

1. **Forensic Toxicology Laboratory Information Management System (LIMS)**
    a. Collaborate with forensic laboratory software vendors that either have systems that can receive FHIR message bundles or have translation tools for those systems
2. **Emergency Medical Services (EMS)**
    a. Collaborate with local EMS organizations; explore requirements and permissions needed to receive EMS/ambulance run sheets
3. **Organ/Tissue Procurement**
    a. Collaborate with OPOs to explore requirements, permissions, and technical details for bidirectional exchange of organ and tissue forensic-toxicology data and of electronic permission and sign-off, as well as requirements for triggers
4. **Fatality Review Teams**
    a. Explore requirements for adding triggers/decision to notification of downstream recipients.
    b. Explore export format that conforms to the flat file for fatality reviews.
5. **NVDRS**
    a. Prioritize data topics in Table 5 for which MDI offices may be a source and have no corresponding MDI FHIR IG resource
    b. Identify states that use the bulk-data upload system
    c. Identify states where the review program is embedded in the MDI office
6. **Drug Overdose Reporting**
    a. Identify the subset of SUDORS Data Dictionary fields that typically come from MDI offices to state SUDORS teams.
7. **Death Data Review**
    a. Test more cases of death certificate review for death data quality improvement and for cremation clearance to surface new data elements that need definition.
    b. Discuss and describe other uses cases of death certificate review by an MDI (besides for death data quality improvement and cremation clearance) that might require additional FHIR resources.

Next Steps for the MDI FHIR IG Project

1. **Forensic Toxicology Laboratory Information Management System (LIMS)**
    a. Define a FHIR message bundle for a requisition form to be sent to a forensic toxicology lab.
    b. Develop API guidance for sending requisitions to and receiving results from forensic toxicology LIMS.
    c. Review the September 2024 ballot of the HL7 Laboratory Report – Universal Realm and the ongoing IG development in the CI Build as a model for FHIR resources for nesting complex lab results.
2. **Emergency Medical Services (EMS)**

a. Reach out to PCC - Paramedicine Care Summary (PCS) FHIR authors to ask if MDI could be a use case and if the MDI community and MDI CMS vendors may join testing efforts.
b. Develop a draft use case for a person declared dead on the scene by EMS, at which point an MDI CMS receives a PCS, just as an EHR would if the person were alive and transferred to an emergency department.
c. Discuss with MDI CMS vendors and NEMSIS the information flows, required permissions, and possible technical barriers to the transmission of PCS FHIR artifacts, particularly the Paramedicine Care Summary Composition Complete Report, from EMS to MDI CMS.

3. **Organ/Tissue Procurement**
    a. Engage with the HL7 PHWG Anatomical Inventory and Person Characteristics project to determine if an anatomical inventory from a postmortem for organ procurement might be a future use case.
    b. Engage with NEDS to learn about any recent work with FHIR and updates to the V2 data element list used in organ and tissue procurement data exchanges.
    c. Develop optional MDI value sets (terminology) related to tissue referrals, such as for the checkboxes on the OPTN DDR form.
    d. Determine the need for (and options for) bidirectional dataflows. Analytical data on removed organs may be important to send back to the MDI office.
4. **Fatality Review Teams**
    a. Explore the Indiana API as a model for future MDI FHIR IG development.
    b. Assess the NFR-CRS data dictionary and reporting forms (versions 6.2) for new MDI data elements or changes to current data elements.
5. **NVDRS**
    a. Review the draft Violent Death and Overdose Reporting (VDOR) FHIR IG, for artifacts to move into the MDI FHIR IG as they are tested and gain maturity.
    b. Develop additional FHIR profiles for high-priority data topics.
6. **Drug Overdose Reporting**
    a. Review a current SUDORS Data Dictionary file (more recent than 2023) for fields that may rely on MDI offices as the primary data source.
    b. Clarify the information that is being received from toxicology, including substance list and details on substance levels for possible terminology reference in the MDI FHIR IG.
    c. Map the SUDORS subset identified by the MDI community to current MDI FHIR IG resources and identify new FHIR resources to develop.

6 Future MDI Topics and Development Strategy

The following topics and questions have been brought up in stakeholder calls and in the HL7 January 2022 Connect-a-thon. They may be considered in future MDI FHIR IG work.

6.1 Autopsy-to-MDI CMS Workflow

Like forensic toxicology, autopsy facilities are an important upstream source of information for MDI. Electronic data exchange from autopsy information systems to MDI CMS could allow those data to be shared further downstream to other users, such as NVDRS. The MDI FHIR IG project could define FHIR resources much like those already defined for the forensic-toxicology dataflow. Starting questions for this topic include:

- What data are expected in the exam-autopsy section of the Composition - MDI to EDRS being sent to the EDRS?
- Does the MDI office need additional data from the autopsy facility (i.e., data used but not included in the Composition - MDI to EDRS)?
- What are the dataflow steps between an autopsy facility and an MDI CMS? (Does a service request from the MDI CMS start the dataflow? What information does the autopsy facility receive from the MDI CMS?)

Stakeholders are particularly interested in being able to share organ-weight information for infant deaths and drug overdoses. Autopsy facilities need common terminologies.

For the MDI FHIR IG project to move forward on this topic, it would need to find autopsy partners for discussions and identify an autopsy facility or autopsy information management system ready for FHIR. Georgia may be interested because the state has a central board of autopsies (the Georgia Board of Investigations) with some centralized reporting. Kansas could be another early partner because that state has both internal and external autopsy services.

6.2 Clinical Information from EHR or HIE to MDI CMS

Stakeholders have noted that MDI offices would benefit from receiving electronic data from electronic health record (EHR) systems and health information exchanges (HIEs) into the MDI CMS. Once an MDI CMS is FHIR-ready, there may be data-sharing permission issues to address. Starting questions for this topic include:

- What is the current dataflow?
- Can clinical documents (such as Continuity of Care Documents [CCDs]) be transformed into FHIR structures conformant to the MDI FHIR IG?
- Could MDI CMS query an EHR or HIE for specific fields so the MDI CMS does not receive irrelevant information? Stakeholders mentioned that MDI offices would like to view the full medical record and don't want to receive a version of the decedent's history assembled or summarized by someone else. The pertinent medical history for how to treat someone is different than identifying how they died.

ASTP is focusing on Trusted Exchange Framework and Common Agreement (TEFCA), which has a roadmap that includes using FHIR and a goal of including public-health use cases. The MDI community can educate itself on opportunities coming from the ASTP work.

6.3 MDI Narrative Search and Exchange

MDI offices produce important data in narrative form. MDI CMS users may be able to tag electronic narratives by topic on creation for querying by key words and phrases. It is common to

use a FHIR RESTful API to query and retrieve data elements or tagged narratives between systems, but this requires the appropriate agreements and permissions between the systems. The first step is the appropriate tagging of narrative blocks.

6.4 Location/Scene

Stakeholders have noted that MDI offices would benefit from standardizing location and scene information, such as:

- Having the option to use any or all of the following fields for location:
  - Address
  - Latitude/longitude or other geolocation measures
  - Place description
  - Date/time
- Having common location-type codes for MDI, such as:
  - Last-seen-alive location
  - Injury location (place of injury)
  - Apparent death location
  - Body-found location

6.5 Additional Social and Demographic Factors in USCDI

USCDI is a standardized set of health data classes and constituent data elements published by ASTP for nationwide, interoperable health information exchange. Most MDI offices are not required to exchange USCDI data elements, however this evolving standard is a helpful source for future MDI data exchange options.

6.5.1 Homelessness

Some MDI offices and jurisdictions collect information on homelessness of decedents (e.g., King Co., WA). Some jurisdictions have a check box (Boolean yes/no or true/false) on the death certificate for homelessness status, while others need more detailed information. Many jurisdictions use data on homelessness to inform local policies because "homeless patients experience poor health outcomes and consume a disproportionate amount of health care resources compared with domiciled patients."[91] USCDI lists "Housing Instability and Homelessness" as a "Level 0" data element in the Social Determinants of Health data class, but comments include those from CDC that "CDC considers this element to be high priority and strongly recommends its inclusion…".[92]

Options for capturing homelessness status in FHIR include:

- **Patient**.address [0..*]
  - Homelessness could be captured as a form of data-absent reason.
  - A homeless shelter will have an address and so the presence of an address will not reflect the homeless condition.
  - Extension: Patient No Fixed Address (https://hl7.org/fhir/extensions/StructureDefinition-no-fixed-address.html): This extension applies to the **Address** data type and is used to indicate that a location address is not a fixed address for an individual. It has a Boolean Extension.value[x].

[91] Zech (2015), https://pubmed.ncbi.nlm.nih.gov/25670759/
[92] ASTP, USCDI, "Housing Instability and Homelessness", https://www.healthit.gov/isp/uscdi-data/housing-instability-and-homelessness

However, the concept of "no fix address" does not distinguish between a comfortable touring life (e.g., "the van life"), as well as homelessness.

- **Observation** profile in HL7 FHIR® Implementation Guide: Electronic Case Reporting (eCR) - US Realm, US Public Health Characteristics of Home Environment (https://hl7.org/fhir/us/ecr/StructureDefinition-us-ph-characteristics-of-home-environment.html)
    - The Observation.value[x] has an extensible binding to Residence and Accommodation Type (https://vsac.nlm.nih.gov/valueset/2.16.840.1.113883.11.20.9.49/expansion). This value set uses SNOMED codes (e.g., code=3291100, " Homeless").
    - The eCR FHIR IG recommends using this observation in combination with any available location information placed in the Patient.address. The IG provides the following guidance on Patient.address: " If the patient is homeless, complete as much address information as possible (city, zip, county, etc.) and use the Characteristics of Home Environment profile to indicate that the patient is homeless."
    - Future updates will likely include moving this observation to US Public Health Profiles Library FHIR IG (see http://hl7.org/fhir/us/ph-library/StructureDefinition/us-ph-characteristics-of-home-environment)
- **Condition** profile in HL7 FHIR® Implementation Guide: SDOH (Social Determinants of Health) Clinical Care - US Realm, Resource Profile: SDOHCC Condition.[93]
    - The Condition.category:SDOH has a required binding to SDOHCC ValueSet SDOH Category.[94] This value set has a code "homelessness".

6.5.2 Tribal Affiliation

Like race and ethnicity, tribal affiliation may be an important factor in understanding patterns of public health and mortality in some jurisdictions, so data may be requested of the relevant MDI office. Tribal affiliation has been included as a USCDI data element starting with USCDI version 3, although no terminology is specified. HL7 defines a code system for tribal entities described below but does not link to an authoritative source or database for a current list maintained by the US Department of the Interior, Bureau of Indian Affairs. The list of "Indian Entities Recognized by and Eligible To Receive Services From the United States Bureau of Indian Affairs" is updated, occasionally, by publication in the Federal Register. (For example, see the notice published by the Indian Affairs Bureau on 12/11/2024, https://www.federalregister.gov/d/2024-29005.) Changes to the recognized entities will not be automatically reflected in the codes available for this data concept, rather the HL7 code system must be updated manually.

US Core 5.0.1 does not define a profile for tribal affiliation, but starting with version 6.0.0, US Core does define a US Core Tribal Affiliation Extension to support USCDI-v3 through draft USCDI-v6. This extension may be used on several FHIR profiles: Patient, RelatedPerson, Person, Practitioner, and FamilyMemberHistory. The US Core Tribal Affiliation Extension has two data elements:

- "tribalAffiliation", with an extensible binding to the HL7 value set, TribalEntityUS, containing codes for entities recognized by the US Bureau Of Indian Affairs.

[93] HL7 SDOHCC Condition profile, https://hl7.org/fhir/us/sdoh-clinicalcare/STU2.2/StructureDefinition-SDOHCC-Condition.html
[94] HL7 SDOHCC ValueSet SDOH Category, https://hl7.org/fhir/us/sdoh-clinicalcare/STU2.2/ValueSet-SDOHCC-ValueSetSDOHCategory.html

- "isEnrolled", with a Boolean value (true/false)

The MDI community may wish to exchange information on tribal affiliation during death investigations or with jurisdictional VROs, state health departments and other applicable partners.

Tribal affiliation (and other patient demographic attributes) defined by profiles and extensions specified in US Core versions published after US Core 5.1.0 can be included in future versions of the MDI FHIR IG. A FHIR IG is allowed to reference (be dependent on) several versions of US Core at the same time, so the MDI FHIR IG can continue to reference the VRDR and VRCL profiles based on US Core 5.0.1 while adding newer US Core profiles and extensions. (For example, see the recent draft of the SDOH Clinical Care FHIR IG[95], which aligns with multiple versions of US Core: 3.1.1, 6.1.0, and 7.0.0.)

6.6 API and Server Interactions

Partners have noted that MDI CMS implementers would benefit from real-world functionality, such as:

- Location-based searching
- Soundex and similar algorithms for names

[95] HL7 SDOH Clinical Care continuous integration build, https://build.fhir.org/ig/HL7/fhir-sdoh-clinicalcare/index.html

7 Acronyms and Abbreviations

ABFT	American Board of Forensic Toxicology
API	application programming interface
ASTP	Assistant Secretary for Technology Policy
BFDR	Birth and Fetal Death Reporting
CDC	Centers for Disease Control and Prevention
CDR	child death review
CFSRE	Center for Forensic Science Research & Education
CI Build	continuous integration build
CLIA	Clinical Laboratory Improvement Amendments
CNPI	Center for National Prevention Initiatives
COMEC	Collaborating Office for Medical Examiners and Coroners
CPS	child protective services
CSTE	Council of State and Territorial Epidemiologists
CTS	Center for Technology Solutions
DDR	deceased donor registration
DNR	death notification registration
DOP	Division of Overdose Prevention, NCIPC
DUA	data-use agreement
DVP	Division of Violence Prevention, NCIPC
EDRS	electronic death reporting systems
EHR	electronic health record
EMS	Emergency Medical Services
FHIR	Fast Healthcare Interoperability Resources
FIMR	Fetal and Infant Mortality Review
FIR	Fetal and Infant Mortality Review
FTCOE	Forensic Technology Center of Excellence
GSRS	Global Substance Registration System
GTRI	Georgia Tech Research Institute
HIE	health information exchange
HL7	Health Level 7 International
HRSA	Health Resources and Services Administration

IHE	Integrating the Healthcare Enterprise
LIMS	laboratory information management system
LOINC	Logical Observation Identifiers Names and Codes
McDIDS	Medical Examiner/Coroner Death Investigation Data Set
MDI CMS	Medicolegal death investigation case management system
MDI	Medicolegal death investigation
MECISP	Medical Examiner/Coroner Information Sharing Program
MPHI	Michigan Public Health Institute
NAME	National Association of Medical Examiners
NCATS	National Center for Advancing Translational Sciences
NCFRP	National Center for Fatality Review and Prevention
NCHS	National Center for Health Statistics
NCIPC	National Center for Injury Prevention and Control
NEDS	New England Donor Services
NEMSIS	National Emergency Medical Services Information System
NEOB	New England Organ Bank
NFLIS	National Forensic Laboratory Information System
NFR-CRS	National Fatality Review Case Reporting System
NIH	National Institutes of Health
NPS	Novel Psychoactive Substances
NVDRS	National Violent Death Reporting System
ODMAP	Overdose Detection Mapping Application Program
ONC	Office of the National Coordinator for Health Information Technology
OPO	organ procurement organization
OPTN	Organ Procurement and Transplantation Network
PHWG	Public Health Work Group
SDO	standards development organization
SDOH	Social Determinants of Health
SDY	Sudden Death in the Young
SIDS	Sudden Infant Death Syndrome
SLED	South Carolina Law Enforcement Division
SMR	Suicide Mortality Review
SNOMED	Systemized Nomenclature of Medicine

SRTR	Scientific Registry of Transplant Recipients
STU	Standard for Trial Use
SUDORS	State Unintentional Drug Overdose Reporting System
SUID	Sudden Unexpected Infant Death
VDOR	Violent Death and Overdose Reporting
VRCL	Vital Records Common Library
VRDR	Vital Records Death Reporting

8 References

- **American Board of Forensic Toxicology (ABFT),** https://www.abft.org/
- **Assistant Secretary for Technology Policy (ASTP),** formerly known as the Office of the National Coordinator for Health Information Technology (ONC).
    - United States Core Data for Interoperability (USCDI), https://www.healthit.gov/isp/united-states-core-data-interoperability-uscdi
    - USCDI "Housing Instability and Homelessness", https://www.healthit.gov/isp/uscdi-data/housing-instability-and-homelessness
- **Center for Forensic Science Research & Education (CFSRE)**, Novel Psychoactive Substances (NPS) Discovery, https://www.cfsre.org/nps-discovery/
- **Centers for Disease Control and Prevention (CDC)**
    - Collaborating Office for Medical Examiners and Coroners (COMEC), https://www.cdc.gov/comec/index.html
    - National Violent Death Reporting System (NVDRS), https://www.cdc.gov/nvdrs/about/index.html (accessed 2025, May 10)
        - *List of Variables Collected in NVDRS/SUDORS system as of 5/2021,* OMB Report, (2021, May), https://omb.report/icr/202112-0920-012/doc/117884100
        - NVDRS Web Coding Manual Version 6.1, revised January 31, 2025, https://www.cdc.gov/nvdrs/media/pdfs/2025/03/nvdrs-coding-manual-version-6.1_508.pdf
    - State Unintentional Drug Overdose Reporting System (SUDORS), https://www.cdc.gov/overdose-prevention/data-research/facts-stats/about-sudors.html (accessed 2025, May 10)
        - SUDORS Fact Sheet, https://www.cdc.gov/overdose-prevention/media/pdfs/2024/04/SUDORS-Fact-Sheet.pdf (accessed 2025, May 10)
        - SUDORS Dashboard: Fatal Overdose Data–Important Data Considerations, https://www.cdc.gov/overdose-prevention/data-research/facts-stats/sudors-dashboard-fatal-overdose-data.html (accessed 2025, May 10)
        - Injury Surveillance Workgroup 7 – The Safe States Alliance, April 2012, *Consensus recommendations for national and state poisoning surveillance,* (reference for definition of a drug is used to determine SUDORS case), https://cdn.ymaws.com/www.safestates.org/resource/resmgr/imported/ISW7%20Full%20Report_3.pdf (accessed 2025, May 10)
    - Sudden Unexpected Infant Death (SUID):
        - SUID and SDY Case Registry, https://www.cdc.gov/sudden-infant-death/php/case-registry/index.html, (accessed 2025, May 10)
- **CDC Foundation**, https://www.cdcfoundation.org/
    - MDI Connect, https://www.cdcfoundation.org/MDI-Connect
- **Epic Systems Corporation**, Epic-on-FHIR, https://fhir.epic.com/
- **Forensic Technology Center of Excellence (FTCOE):** Ropero-Miller, Jeri, Nichole Bynum, Kelly Keyes, Erica Fornaro, and Micaela Ascolese. *Data Exchange Practices of Medicolegal Death Investigation.* US Department of Justice, National Institute of Justice, Office of Investigative and Forensic Sciences, December 2022.

https://nij.ojp.gov/library/publications/data-exchange-practices-medicolegal-death-investigation, (accessed 2025, May 10)
    - Note that Appendix A of this document contains oft-cited graphics that are sometimes referred to as the "grapes of death" or the "bunch of grapes diagrams."
- **Georgia Tech Research Institute (GTRI)**
    - Raven Testing Platform, https://raven.heat.icl.gtri.org/
    - Raven Documentation, https://ravendocs.readthedocs.io/en/latest/
- **Hanzlick R**. The Centers for Disease Control and Prevention's Medical Examiner/Coroner Information Sharing Program (MecISP). *J Forensic Sci.* 1997 May;42(3):531-2. *Erratum in: J Forensic Sci* 1997 Jul;42(4):761. PMID: 9144947. https://pubmed.ncbi.nlm.nih.gov/9144947/
- **Health Level 7 (HL7) International**
    - HL7 CDA Implementation Guides and Standards
        - Emergency Medical Services; Patient Care Report, Release 3.0.1 - US Realm, https://www.hl7.org/implement/standards/product_brief.cfm?product_id=438
    - HL7 FHIR Base Resources
        - HL7, Release 4.0.1, http://hl7.org/fhir/R4/
        - HL7, Release 5, http://hl7.org/fhir/
        - HL7, Resource BodyStructure, http://hl7.org/fhir/bodystructure.html
        - HL7, Code System, Binding Strength, https://www.hl7.org/FHIR/codesystem-binding-strength.html
        - HL7, Value Set, Body Site, http://hl7.org/fhir/valueset-body-site.html
        - HL7, Versions (maturity), http://hl7.org/fhir/versions.html#maturity
    - HL7 FHIR Implementation Guides and Standards
        - Anatomical Inventory and Person Characteristics, https://www.hl7.org/special/Committees/projman/searchableProjectIndex.cfm?action=edit&ProjectNumber=1851 & https://confluence.hl7.org/spaces/OO/pages/184928725/Anatomical+Inventory+and+Person+Characteristics
        - Birth and Fetal Death Reporting (BFDR), https://www.hl7.org/implement/standards/product_brief.cfm?product_id=575 & https://hl7.org/fhir/us/bfdr/
        - International Patient Summary (IPS), http://www.hl7.org/implement/standards/product_brief.cfm?product_id=483 & http://hl7.org/fhir/uv/ips/
        - Laboratory Report, https://hl7.org/fhir/uv/lab-report/2024Sep/ & https://build.fhir.org/ig/HL7/uv-lab-rep-ig/
        - Medicolegal Death Investigation (MDI), http://www.hl7.org/implement/standards/product_brief.cfm?product_id=604 & http://hl7.org/fhir/us/mdi/
        - Radiation Dose Summary for Diagnostic Procedures on FHIR, https://build.fhir.org/ig/HL7/fhir-radiation-dose-summary-ig/index.html
        - SDOH Clinical Care, Release 2.2 - US Realm, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=572 & https://hl7.org/fhir/us/sdoh-clinicalcare/STU2.2/

        - SDOH Clinical Care continuous integration build, https://build.fhir.org/ig/HL7/fhir-sdoh-clinicalcare/index.html
            - SDOHCC Condition, https://hl7.org/fhir/us/sdoh-clinicalcare/STU2.2/StructureDefinition-SDOHCC-Condition.html
    - US Core Implementation Guide, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=500 & http://hl7.org/fhir/us/core/
    - Version 2 to FHIR, https://build.fhir.org/ig/HL7/v2-to-fhir/
        - ConceptMap: Segment PID to Patient Map (Experimental), https://build.fhir.org/ig/HL7/v2-to-fhir/ConceptMap-segment-pid-to-patient.html
        - ConceptMap: Segment PV1 to Patient Map (Experimental), https://build.fhir.org/ig/HL7/v2-to-fhir/ConceptMap-segment-pv1-to-patient.html
    - Vital Records Common Library (VRCL), http://www.hl7.org/implement/standards/product_brief.cfm?product_id=577 & http://hl7.org/fhir/us/vr-common-library/
    - Vital Records Death Reporting (VRDR) - US Realm, http://www.hl7.org/implement/standards/product_brief.cfm?product_id=532 & http://hl7.org/fhir/us/vrdr/
  - Work Groups and Projects
    - Orders and Observations Work Group minutes, 2022-05-09-13 WGM, https://confluence.hl7.org/display/OO/2022-05-09-13+WGM
    - Orders and Observations Work Group minutes, 2022-12-08 Main, https://confluence.hl7.org/display/OO/2022-12-08+Main
    - Project Summary for Transplant, Transfusion, and Grafts on FHIR, https://www.hl7.org/special/Committees/projman/searchableProjectIndex.cfm?action=edit&ProjectNumber=1370
- **Health Resources and Services Administration (HRSA),** *2023 Annual Data Report*, US Organ Procurement and Transplantation Network (OPTN) and the Scientific Registry of Transplant Recipients (SRTR), https://srtr.transplant.hrsa.gov/adr/adr2023 (accessed 2025, May 10)
- **Integrating the Healthcare Enterprise (IHE) Resources**
  - EMS Interoperability Solutions: EMS- Overview Home (2023, January 27), https://build.fhir.org/ig/IHE/EMS-Overall/
  - IHE Wiki Main Page, (2022, August 23), https://wiki.ihe.net/
  - Paramedicine Care summary (PCS), (2022, May 10), https://wiki.ihe.net/index.php/Paramedicine_Care_Summary_(PCS)
  - Path to Production: Advancing Interoperability for Emergency Medicine Services, (2022, August 22), https://www.iheusa.org/node/114
  - PCC – Paramedicine Care Summary (PCS), (2023, January 27), https://build.fhir.org/ig/IHE/PCC.PCS/ & https://github.com/IHE/PCC.PCS/
- **InVita** Healthcare Technologies, https://www.invitahealth.com/
- **Iowa**, *Revised Uniform Anatomical Gift Act,* Iowa Code 2023, Section 142C.4A. (2022, December 29), https://www.legis.iowa.gov/docs/code/142C.4A.pdf
- **LifeLogics,** Copernicus, https://www.lifelogics.org/Products/CopernicusApps) -

- **National Center for Fatality Review and Prevention (NCFRP)**
  - About Us, https://ncfrp.org/about-us/
  - CDR Report Form Version 6.2 – National Fatality Review Case Reporting System, February 2025, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/CDR_NFR-CRS_v6-2.pdf (accessed 2025, May 10)
  - FIMR Report Form Version 6.2 – National Fatality Review Case Reporting System, February 2025, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/FIMR_NFR-CRS_v6-2.pdf (accessed 2025, May 10)
  - National Fatality Review Case Reporting System (NFR-CRS), https://data.ncfrp.org/
  - NCFRP Data Dictionary – National Fatality Review Case Reporting System, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/DataDictionary_CRS_v6-2.pdf (accessed 2025, May 10)
- **National Commission on Forensic Science (NCFS)**
  - Recommendation on Electronic Networking of Medical Examiner and Coroner Offices (Adopted at NCFS Meeting #7 - August 10-11, 2015), https://www.justice.gov/ncfs/file/787351/dl?inline
  - See also: https://www.justice.gov/archives/ncfs/work-products
- **National Forensic Laboratory Information System (NFLIS**), https://www.justice.gov/archives/ncfs
  - NFLIS-MEC Medical Examiner and Coroner Offices, https://www.nflis.deadiversion.usdoj.gov/mec.xhtml
  - NFLIS-TOX Toxicology Laboratories, https://www.nflis.deadiversion.usdoj.gov/tox.xhtml
- **National Highway Traffic Safety Administration (NHTSA)**, Fatality Analysis Reporting System (FARS), https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars
- **National Institute of Justice (NIJ)**
  - Forensic Toxicology, https://nij.ojp.gov/topics/forensics/forensic-toxicology
- **NEDS** - New England Donor Services, https://neds.org/
- **NEMSIS** - National Emergency Medical Services Information System, https://nemsis.org/
- **NIST** - National Institute of Standards and Technology, Medicolegal Death Investigation Subcommittee, https://www.nist.gov/organization-scientific-area-committees-forensic-science/medicolegal-death-investigation
- **NIST,** Organization of Scientific Area Committees (OSAC), (2021, July 14). *Medicolegal death investigation data commonly collected and exchanged,* https://www.nist.gov/system/files/documents/2021/07/14/MDI%20data%20commonly%20collected%20and%20exchanged_REFERENCE_07092021_0.pdf
- **OPTN** - Organ Procurement & Transplantation Network, Data collection, https://optn.transplant.hrsa.gov/data/about-data/data-collection/
- **Pinckard**, J. K., Geiselhart, R. J., Moffatt, E. Schmunk, G.A., Schultz, D. L., Utley, S. R., & Wetzler, S. B. (2014). National Association of Medical Examiners Position Paper: Medical Examiner Release of Organs and Tissues for Transplantation. *Academic Forensic Pathology* 2014 (4): 497-504. https://name.memberclicks.net/assets/docs/d2701a9a-008f-4502-9fc2-52b0d4f67fc4.pdf
- **Pinckard**, J. K., Wetli, C. V., & Graham, M. A. (2007). National Association of Medical Examiners Position Paper on the Medical Examiner Release of Organs and Tissues for

Transplantation. *The American Journal of Forensic Medicine and Pathology* 28(3), 202-207. https://www.life-source.org/wp-content/uploads/2020/01/Medical-Examiner-Release-of-Organs-and-Tissues-for-Transplantation.pdf

- **South Carolina Law Enforcement Division (SLED)** Forensic Services, https://www.sled.sc.gov/forensics
- **Systemized Nomenclature of Medicine (SNOMED)**, https://www.snomed.org/ & browser, https://browser.ihtsdotools.org/?
- **UNOS** - United Network for Organ Sharing, UNet, https://unos.org/technology/unet/ & Deceased Donor Registration Worksheet. https://unos.org/wp-content/uploads/DDR.pdf
- **Zech** J, Husk G, Moore T, Kuperman GJ, Shapiro JS. Identifying homelessness using health information exchange data. *J Am Med Inform Assoc.* 2015 May;22(3):682-7. doi: 10.1093/jamia/ocu005. Epub 2015 Feb 10. PMID: 25670759; PMCID: PMC11737380. https://pubmed.ncbi.nlm.nih.gov/25670759/

9 Discussion Participants

9.1 MDI Connect Participants (2023-2025)

MDI offices and their data-sharing partners worked together to analyze the current data flow mechanisms between their systems and to design and test more efficient approaches, often using FHIR, to improve both data quality and efficiency. The MDI FHIR IG has benefited from the insights of these experts. MDI Connect projects are described on https://www.cdcfoundation.org/MDI-Connect-Sites.

The Community of Participating MDI Offices:

- Alabama: Jefferson County Coroner / Medical Examiner Office
- Alaska: State Medical Examiner's Office; AK Health Analytics and Vital Records
- Connecticut: Office of the Chief Medical Examiner; CT Department of Public Health, State Vital Records
- Florida: Division Forensic Medicine, University of Florida
- Georgia: DeKalb County Medical Examiner's Office; GA Department of Public Health, State Office of Vital Records
- Illinois: Cook County Medical Examiner's Office
- Indiana: Marion County Coroner's Office; Indiana Department of Health
- Michigan: Sparrow Foundation; MI Department of Health and Human Services; MI Health Information Network Shared Services (MiHIN); MiCelerity; Wayne County Medical Examiner's Office; Wayne State University
- Minnesota: Midwest Medical Examiner's Office; MN IT Services (MNIT)
- Mississippi: Mississippi Department of Public Safety: MS State Department of Health
- Nevada: Clark County Office of the Coroner/Medical Examiner
- New Hampshire: Office of the Chief Medical Examiner; Secretary of State, Division of Vital Records Administration
- Ohio: Butler County Coroner's Office; Butler County General Health District
- Pennsylvania: York County Coroner's Office
- South Carolina: Charleston County Coroner's Office; SC Law Enforcement Division; Greenville County Coroner's Office
- Maryland/District of Columbia: Washington/Baltimore High Intensity Drug Trafficking Area
- Washington: King County Medical Examiner's Office; WA State Department of Health Vital Records Office

The Community of Participating Software Vendors:

- Axiell (MS EDRS vendor)
- Cohero (PA MDI CMS vendor)
- Coroner Files (SC CMS vendor)
- CNSI (NH EDRS vendor)
- Genesis (GA EDRS vendor)
- LabLynx (IL MDI CMS vendor)
- MAPSYS (OH MDI CMS vendor)

- MDILog (GA, MI, NH, MS and SC MDI CMS vendor)
- NetSmart (AK EDRS vendor)
- NMS Labs (NM, PA, IL, forensic lab vendor)
- Porter Lee Corporation, Crime Fighter BEAST (SC forensic lab vendor)
- QuincyTech (CT, and MI MDI system CMS vendor)
- VertiQ (AK, NV, WA and MN MDI CMS vendor)
- VitalChek (CT, IN, MI EDRS vendor)

9.2 2022-23 Discussions with Subject Matter Experts

Forensic Toxicology Laboratory Information System: Lantana hosted a call on 3/6/2023 with CDC and NMS laboratory-data experts to discuss forensic-toxicology data needs from MDI or autopsy facility to toxicology lab, and toxicology LIMS returning results to the MDI office.

- NCHS, CDC
  - Kate Brett, Collaborating Office for Medical Examiners and Coroners
  - Cynthia Bush, Classifications and Public Health Data Standards
- NMS Labs
  - Eric Mullen, EDI Administrator
  - Deirdre O'Neill, Director of Laboratory Informatics
  - Michael Losacco, IT System Support Manager
  - David Delia, Chief Financial Officer
- Lantana Consulting Group
  - Diana Wright, Data Standards Technical Editor
  - Kris Done, Clinical Analyst
  - Joanna Chan, Project Manager

Organ/Tissue Procurement: CDC hosted a call on 3/8/2023 with Lantana and NEDS data experts on organ- and tissue-donation data needs from medical examiner and coroners.

- NCHS, CDC
  - Kate Brett, Collaborating Office for Medical Examiners and Coroners
  - Margaret Warner, Collaborating Office for Medical Examiners and Coroners
  - Cynthia Bush, Classifications and Public Health Data Standards
- NEDS organ (and tissue) procurement organization subject-matter experts
  - Alexandra Glazier, President & CEO
  - Mathew Moss, Sr. Vice President & CIO
  - Mark DeFilippis, Vice President, Tissue Operations
  - Sean M. Fitzpatrick, Chief Public Affairs Officer
  - Anthony Cannata, Medical Examiner & Funeral Home Liaison
- Lantana Consulting Group
  - Diana Wright, Data Standards Technical Editor
  - Kris Done, Clinical Analyst

Child-Death Review Teams: Lantana hosted a call on 12/8/2022 with CDC and MPHI data experts supporting child-death review teams and resources. The CDC funds the National Center for Surveillance project and uses the National Center's platform for their surveillance system, Sudden Death in the Young Case Registry.

- CDC, NCHS

    - Kate Brett, Collaborating Office for Medical Examiners and Coroners
    - Margaret Warner, Collaborating Office for Medical Examiners and Coroners
    - Erica Lancaster, Collaborating Office for Medical Examiners and Coroners
    - Cynthia Bush, Classifications and Public Health Data Standards
- CDC, NCCDPHP
    - Carri Cottengim, Division of Reproductive Health
- MPHI, NCFRP
    - Abby Collier, Director of the National Center, NCFRP
    - Meghan Faulkner, Director of the SUID and Sudden Death in the Young Case Registry Data Coordinating Center
    - Heather Dykstra, Senior Data Analyst managing the National Fatality Review Case Reporting System
    - Esther Shaw, Senior Data Analyst, providing data support to Child Death Review teams and Fetal and Infant Mortality Review teams across the US
    - Gabrielle Fraley, CHES, Senior Data Analyst, working with the National Fatality Case Review System
    - Sasha Mintz, Senior Epidemiologist supporting users of the National Fatality Review-Case Reporting System and disseminating data using an equity lens.
- MPHI, CTS
    - Kerie Hughes, Director of Technical Services
    - Peter Jantos, Senior Software Developer for the Technology Solutions team
- Lantana Consulting Group
    - Diana Wright, Data Standards Technical Editor
    - Kris Done, Clinical Analyst
    - Christinna Robinson, Project Manager

NVDRS: Lantana hosted a call on 1/11/2023 with CDC staff from NCHS and from the National Center for Injury Prevention and Control, Division of Violence Prevention (NCIPC/DVP), which supports the NVDRS.

- NCHS
    - Kate Brett, Collaborating Office for Medical Examiners and Coroners
    - Margaret Warner, Collaborating Office for Medical Examiners and Coroners
    - Cynthia Bush, Classifications and Public Health Data Standards
- NCIPC/DVP — NVDRS data experts
    - Janet Blair, Mortality Surveillance Team
    - Katherine Fowler, Senior Scientist
    - Bridget Lyons, Epidemiologist
    - Kristin Holland, Branch Chief
    - Scott Van Heest, IT Specialist
    - Craig Bryant, IT Specialist
- Lantana Consulting Group
    - Diana Wright, Data Standards Technical Editor
    - Kris Done, Clinical Analyst

SUDORS: Lantana hosted a call on 1/30/2023 with CDC staff from NCHS and from the National Center for Injury Prevention and Control, Division of Overdose Prevention (NCIPC/DOP), which hosts SUDORS.

- NCHS
    - Kate Brett, Collaborating Office for Medical Examiners and Coroners
    - Margaret Warner, Collaborating Office for Medical Examiners and Coroners
    - Erica Lancaster, Collaborating Office for Medical Examiners and Coroners
    - Cynthia Bush, Classifications and Public Health Data Standards
- NCIPC/DOP—SUDORS data experts
    - Londell McGlone, Team Lead for the Overdose Data Management Team - SUDORS
    - Nicole Davis, Acting Branch Chief for the Epidemiology and Surveillance Branch
    - Christine Mattson, Acting Team Lead for the Overdose Mortality Team, SUDORS
- Lantana Consulting Group
    - Diana Wright, Data Standards Technical Editor
    - Kris Done, Clinical Analyst
    - Christinna Robinson, Project Manager

Appendix A - Data Elements Details

A.1 CDR

MPHI Flat-File Import Template Data Fields for CDR Report Form[96]

Field	Acceptable Values
Your State ID	**Required**: Enter your state, not the child's state of residence if different
Case Definition - Death Cert #	text to 255 chars or blank
Case Definition - Birth Cert #	text to 255 chars or blank
Case Definition - ME/Coroner #	text to 255 chars or blank
Section A – Child Information	
A1 - Child's First Name	**Required**: text to 255 chars
A1 - Child's Middle Name	text to 255 chars or blank
A1 - Child's Last Name	**Required**: text to 255 chars
A2 - Child's Date of Birth - month	integer 1 - 12 or blank
A2 - Child's Date of Birth - day	integer 1 - 31 or blank
A2 - Child's Date of Birth - year	integer values 1900-2050 or blank
A3 - Child's Date of Death - month	integer 1 - 12
A3 - Child's Date of Death - day	integer 1 - 31
A3 - Child's Date of Death - year	integer values 1900-2050
A4 - Child's Age	**Required**: values 0 - 365
A4 - Child's Age Category	**Required**: values 1=Yrs, 2= Mnths, 3=Days, 4=Hrs, 5=Min
A5 - Child's Race - Alaska Native	values 1=Y, 0=N, blank
A5 - Child's Race - Alaska Native - specify tribe	text up to 255 chars
A5 - Child's Race - American Indian	values 1=Y, 0=N, blank
A5 - Child's Race - American Indian - specify tribe	text up to 255 chars or blank
A5 - Child's Race - Asian	values 1=Y, 0=N, blank
A5 - Child's Race - Asian - specify	text up to 255 chars or blank
A5 - Child's Race - Black	values 1=Y, 0=N, blank
A5 - Child's Race - Native Hawaiian	values 1=Y, 0=N, blank
A5 - Child's Race - Pacific Islander	values 1=Y, 0=N, blank
A5 - Child's Race - Pacific Islander - specify	text up to 255 chars or blank
A5 - Child's Race - White	values 1=Y, 0=N, blank
A5 - Child's Race - Unknown	values 1=Y, 0=N, blank
A5 - Child's Race - Multi-racial	values 1=Y, 0=N, blank
A6 - Was Child Hispanic or Latino/a	values 1=Y, 2=N, 9=Unk, 0 or blank
A7 - Child's Sex	values 1=M, 2=F, 9=Unk, 0 or blank if unknown
A8 - Child's Address Street	text up to 255 chars or blank
A8 - Child's Address Apt	text up to 255 chars or blank
A8 - Child's Address City	text up to 255 chars or blank

[96]NCFRP, CDR Report Form, https://ncfrp.org/data/nfr-crs/ & https://ncfrp.org/wp-content/uploads/CDR_NFR-CRS_v6-2.pdf

Field	Acceptable Values
A8 - Child's County of Residence	values see codebook for integer values or blank
A8 - Child's State of Residence	text, 2 char postal abbreviation, OC = Out of Country, or blank
A8 - Child's Zip code	text up to 15 chars or blank
A11 - State of Death	text, 2 char postal abbreviation, OC = Out of Country, or blank
A12 - County of Death	values see codebook for integer values or blank
A27 - Education of Child only CDR non-infants	values in codebook: 1=N/A, 2=None, etc or blank
A44 - Gestational Age in weeks	values 0 - 50 or blank: this field is only for infants
A45 - Birth weight in grams	integer: can be blank; this field is only for infants
A46 - Was this a multiple gestation pregnancy?	values 1=Y, 2=N, 9=Unk, 0 or blank; infant only field
A46 - If multiple gestation pregnancy, total number fetuses in pregnancy including the deceased infant?	Integer: can be blank; this field is only for infants
A49 - Not including the deceased infant, the number of children the childbearing parent still has living.	Integer: can be blank; infant only field
A50 - Prenatal care provided to childbearing parent?	values 1=Y, 2=N, 9=Unk, 0 or blank; infant only field
A50 - If yes, number of prenatal care visits kept	values 1-50 or blank: infant only field
A50 - If yes, month first visit kept	values from codebook 1st-9th month, 99=Unk or blank: infant only field
A52/94 - Childbearing parent had medical complications - chorioamnionitis?	values 1=Y,0=N or blank, infant only field
A52/94 - Childbearing parent had medical complications -Gestational Diabetes?	values 1=Y,0=N or blank, infant only field
A52/94 - Childbearing parent had medical complications -Eclampsia?	values 1=Y,0=N or blank, infant only field
A52/94 - Childbearing parent had medical complications -Herpes?	values 1=Y,0=N or blank, infant only field
A52/94 - Childbearing parent had medical complications -Gestational Hypertension?	values 1=Y,0=N or blank, infant only field
A52/94 - Childbearing parent had medical complications -PROM?	values 1=Y,0=N or blank, infant only field
A61 - In 3 months before pregnancy - # cigarettes/day	values integer or blank; infant only field
A62 - Smoke during pregnancy - # cigarettes/day - trimester 1	values integer or blank; infant only field
A62 - Smoke during pregnancy - # cigarettes/day - trimester 2	values integer or blank; infant only field
A62 - Smoke during pregnancy - # cigarettes/day - trimester 3	values integer or blank; infant only field

Field	Acceptable Values
A66 - Infant ever breastfed?	values 1=Y, 2=N, 9=Unk or blank; infant only field
Section E – Incident Information	
E1 - Date of incident - month	integer 1 - 12 or blank
E1 - Date of incident - day	integer 1 - 31 or blank
E1 - Date of incident - year	integer values 1900-2050 or blank
E2 - Approximate Time of day that the incident occurred	values 1 - 12, round to nearest hour, use with AM/PM field (12 PM is noon, 12 AM is midnight); can leave blank
E2 - Time of incident: AM or PM	values 1=AM, 2=PM, use with Time of Day field; can leave blank
E2 - Time of incident: AM or PM	values 1=AM, 2=PM, use with Time of Day field; can leave blank
E5 - Incident state	text, 2 char postal abbrev, OC = Out of Country, or blank
E6 - Incident county	values from codebook, integer or blank
Section F – Investigation Information	
F5 - Was an Autopsy performed	Values 1=Y, 2=N, 9=U or blank
F8 - Was a Tox screen positive for Alcohol	Values 1=Y, 0=N or blank
F8 - Was a Tox screen positive for Cocaine	Values 1=Y, 0=N or blank
F8 - Was a Tox screen positive for Marijuana	Values 1=Y, 0=N or blank
F8 - Was a Tox screen positive for Opioids	Values 1=Y, 0=N or blank
Section G – Official Manner and Cause of Death	
G1 - Cause of Death Code	ICD-10 code
G2 - Immediate cause	text less than 255 chars or blank
G2 - Cond 1	text less than 255 chars or blank
G2- Cond 2	text less than 255 chars or blank
G2 - Cond 3	text less than 255 chars or blank
G3 - Other Cond	text less than 255 chars or blank
G4 - If injury, how injury occurred	text less than 255 chars or blank
G5 - Manner of Death	from codebook: 1=Nat, 2=Acc, 3=Suic, 4=Hom, 5=Undet, 6=Pending, 9=Unk or blank

A.2 OPO: OPTN Data Elements in DDR Worksheet

Source: UNOS DDR Worksheet, https://unos.org/wp-content/uploads/DDR.pdf

Relevant Data Elements from OPTN Deceased Donor Registration Worksheet

Patient Demographics	Name	Last First MI
	DOB	(date)
	Age	Months or Years
	Birth Sex	Male Female
	Residence	Home city State Zip code

Patient Demographics	Name	Last First MI
	Ethnicity/Race	**American Indian or Alaska Native** American Indian Eskimo Aleutian Alaska Indian American Indian or Alaska Native: Other American Indian or Alaska Native: Not Specified **Asian** Asian Indian/Indian Sub-Continent Chinese Filipino Japanese Korean Vietnamese Asia: Other Asia: Not Specified/Unknown **Black or African American** African American African (Continental) West Indian Haitian Black or African American: Other Black or African American: Not Specified/Unknown **Hispanic/Latino** Mexican Puerto Rican (Mainland) Puerto Rican (Island) Cuban Hispanic/Latino: Other Hispanic/Latino: Not Specified/Unknown **Native Hawaiian or Other Pacific Islander** Native Hawaiian Guamanian or Chamorro Native Hawaiian or Other Pacific Islander: Other Native Hawaiian or Other Pacific Islander: Not Specified/Unknown **White** European Descent Arab or Middle Eastern North African (non-Black) White: Other White: Not Specified/Unknown
	Citizenship	US Citizen Non-US Citizen/ US Resident Non-US Citizen/Non-US Resident

Patient Demographics	Name	Last First MI
		Unknown
	Home Country	(text)
Cause of Death		Anoxia Cerebrovascular/Stroke Head Trauma CNS Tumor Other Specify (text)
Mechanism of Death		Drowning Seizure Drug Intoxication Asphyxiation Cardiovascular Electrical Gunshot Wound Stab Blunt Injury SIDS Intracranial Hemorrhage/Stroke Death From Natural Causes None of the Above
Circumstance of Death		MVA Suicide Homicide Child-Abuse Accident, Non-MVA Death From Natural Causes None of the Above
Medical Examiner/Coroner		No Yes, Medical Examiner Consented Yes, Medical Examiner Refused Consent Unknown
Clinical Information	Height Weight	(feet/inches or centimeters) (pounds or kilograms)

A.3 NVDRS

Sources for Data Topics in NVDRS[97]

Data Topic	DC	C/ME	LE	CFR	LAB	USER	HOSP
Case status						x	
Incident narrative		x	x	x			
Document tracking						x	

[97] CDC, NVDRS Web Coding Manual Version 6.1, https://www.cdc.gov/nvdrs/media/pdfs/2025/03/nvdrs-coding-manual-version-6.1_508.pdf (18-19)

Data Topic	DC	C/ME	LE	CFR	LAB	USER	HOSP
Person type	x	x	x				
Zip code, county	x	x	x				
Age/sex/race/ethnicity	x	x	x				
When and where (injury/death)	x	x	x				
Type of medical treatment (inpatient or emergency department)							x
Cause of death ICD-10 code(s)	x						
External injury ICD-9-CM code(s)							x
Manner of death	x	x		x		x	x
Additional person descriptors	x	x	x	x			
Alcohol and drug tests		x					
Wounds		x	x				
Circumstances		x	x				
Victim-suspect relationship		x	x				
History of victim abuse		x	x				
Suspect was victim caretaker		x	x				
Weapon type	x	x	x			x	
Firearm descriptors		x	x		x		
Poison details		x	x				

DC=death certificate; C/ME=coroner/medical examiner; LE=law enforcement report; CFR=child fatality review; LAB=crime lab; USER=user of NVDRS software/abstractor(s); HOSP=hospital