NEMSIS TAC Whitepaper

EMS and Trauma Registry Integration Using the NEMSIS UUID

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Introduction

This document provides guidance to software developers of emergency medical services (EMS) data systems and trauma registry data systems on implementing data linkage using the universally unique identifier (UUID) that was added to the National EMS Information System (NEMSIS) standard in version 3.5.0. It also provides guidance for linking EMS and trauma records in regional, state, and national registries using the National EMS Information System (NEMSIS) UUID.

Introduced in NEMSIS v3.5.0, UUIDs are assigned to all data objects within an EMS agency at the time the data objects are created in the agency's NEMSIS-compliant software. Most of the UUIDs exist within agency demographic data (locations, personnel, vehicles, etc.), but a UUID is also assigned to each patient care report (PCR). The primary purpose of the UUID is to enable NEMSIS "Receive and Process" systems to successfully process data updates from NEMSIS "Collect Data" systems. Since each data object has an unchanging UUID assigned to it, the UUID serves as a unique key for determining exactly which record to update in the receiving system. For more information about the implementation of UUIDs in NEMSIS, see the NEMSIS V3 UUID Guide.

The PCR UUID is the subject of this guide. The UUID is software-generated using a defined algorithm, mandatory on every PCR, guaranteed to be unique, and contains no patient identifying information. Because of these attributes, the UUID is valuable in data linkage. The American College of Surgeons (ACS) recommends leveraging the NEMSIS PCR UUID for linkage with trauma registry data, using the following approach:
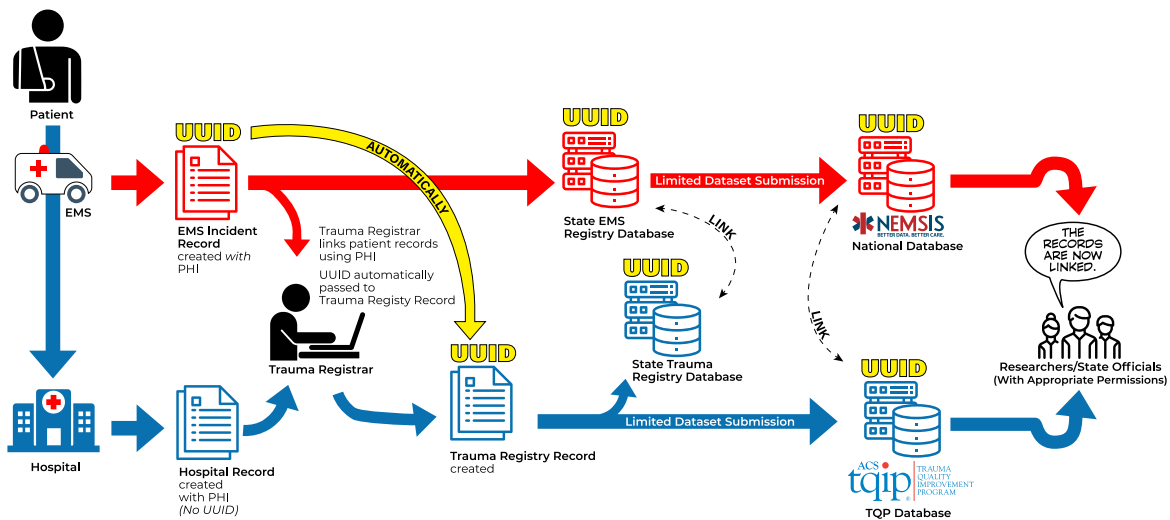
Figure 1. Hospital trauma registry abstraction and data flow, incorporating the NEMSIS PCR UUID

In this approach, EMS PCRs are sent from an EMS data system to a trauma registry. When working on a trauma record, a trauma registrar searches for EMS PCRs that represent the EMS responses to the same patient at the same incident. When the trauma registrar identifies an EMS PCR associated with a trauma record, the UUID from the EMS PCR is imported into the trauma record. From that point on, whenever a PCR or trauma record is sent from one system to another, it includes the PCR UUID. At any level, those with access to both the trauma data and the EMS data can re-join the records via the UUID to create a linked data set for quality improvement or research.

This document provides guidance regarding the implementation details of this process.

Sending EMS Records to the Trauma Registry

The first step in the process is for the EMS data system to send PCRs to the trauma registry so the data can be available to trauma registrars.
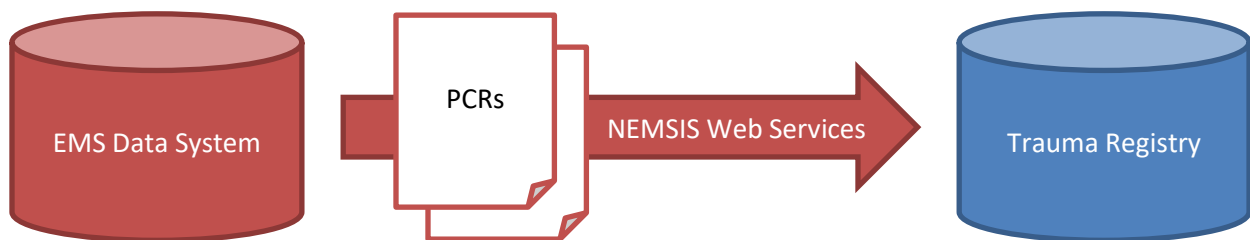
Records to Transfer

Developers of EMS data systems may decide to simply send all PCRs to the trauma registry, or they may choose to apply criteria such as these to limit the number of PCRs sent:

- Incident Date is within the past X days (depending on how long trauma registrars can take to create trauma records after a patient has been discharged).
- Possible injury is "Yes."

- The disposition indicates that a patient was treated.
- The PCR has been finished/completed.

Important Data Elements

The EMS system may simply send the full PCR, or it may send a subset of data from the PCR that is important for the trauma registry. If a subset of information is sent, it should include:

- Data elements that help the trauma registrar to identify a PCR to link to the trauma record, such as:
    - EMS agency number and name
    - Responding unit call sign, role, and capability
    - Patient name, gender, and date of birth
    - Incident date and location
    - Disposition and destination
- Data elements that are important for quality improvement and research in the trauma registry, such as:
    - Times (incident onset, EMS response)
    - Injury details
    - Vital signs
    - Procedures
    - Trauma triage and transport

Data Format

The NEMSIS TAC recommends using the NEMSIS Web services architecture and the NEMSIS XML data format to transfer PCRs to the trauma registry.
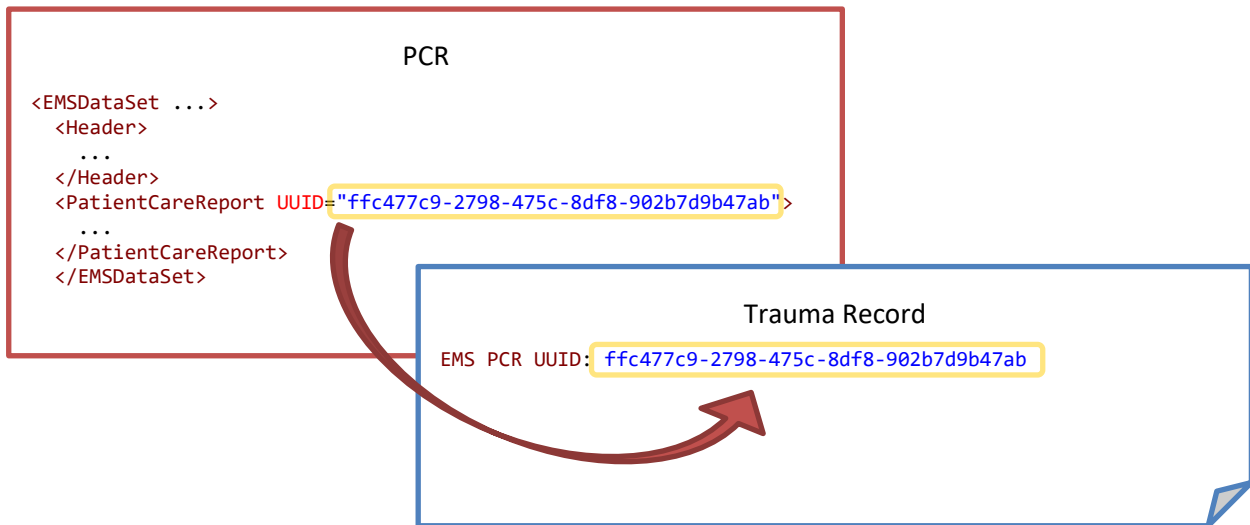
Searching for EMS Records in the Trauma Registry

The trauma registry should store the PCRs so they can be searched by registrars. The trauma registry should provide an interface that allows trauma registrars to search for PCRs that may match the patient and incident that they are recording.

Trauma Registry PCR Import								
Import	*Agency*	*Incident #*	*Date*	*Name*	*Gender*	*DOB*	*Disposition*	*Destination*
➡	Central Fire	21-0427	9/1/2021	Elicia Stubbs	F	4/21/1967	Transport by another EMS Unit	Victor EMS
➡	Victor EMS	211394	9/1/2021	Elicia Stubbs	F	4/21/1967	Transport by This EMS Unit (This Crew Only)	Memorial Hospital
➡	Memorial Hospital EMS	M21-765	9/1/2021	Elicia Stubbs	F	4/21/1967	Transport by This EMS Unit (This Crew Only)	Tri-state Medical Center

The NEMSIS TAC recommends that developers of trauma registry software implement a process to purge PCRs that have not been linked to a trauma recorded after some time (depending on how long trauma registrars can take to create trauma records after a patient has been discharged).

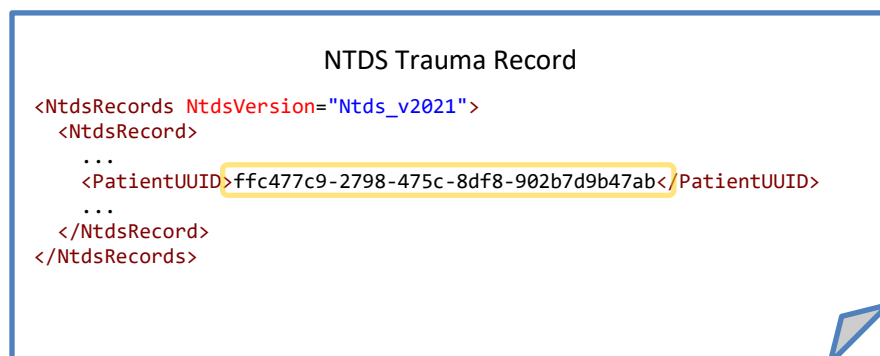## Linking an EMS Record to a Trauma Record in the Trauma Registry

Trauma registry software should provide a way for a trauma registrar to select a PCR to link to the trauma record. When the selection is made, the trauma registry should import the UUID from the PCR into the trauma record (the UUID is an XML attribute on the `PatientCareReport` data element). The UUID should not be visible to the trauma registrar. Trauma registries should not require trauma registrars to manually enter PCR UUIDs in trauma records.

PCR

```
<EMSDataSet ...>
  <Header>
    ...
  </Header>
  <PatientCareReport UUID="ffc477c9-2798-475c-8df8-902b7d9b47ab">
    ...
  </PatientCareReport>
</EMSDataSet>
```

Trauma Record

EMS PCR UUID: ffc477c9-2798-475c-8df8-902b7d9b47ab

The trauma registry may also import other data from the PCR so it can be readily available in the registry for quality improvement and research.

Sending the EMS Record UUID in the Trauma Record

When the trauma registry sends the trauma record to other systems in National Trauma Data Standard (NTDS) format, it should include the UUID from the linked PCR in the NTDS `PatientUUID` data element. (Note that though the NTDS data element is named "PatientUUID," the UUID identifies an EMS PCR, not a patient).

NTDS Trauma Record

```
<NtdsRecords NtdsVersion="Ntds_v2021">
  <NtdsRecord>
    ...
    <PatientUUID>ffc477c9-2798-475c-8df8-902b7d9b47ab</PatientUUID>
    ...
  </NtdsRecord>
</NtdsRecords>
```

Linking EMS and Trauma Records in Regional, State, and National Registries

Regional, state, and national registries will need access to both EMS and trauma data to create linked data sets.

Each trauma record that has been successfully linked to an EMS record will contain a value in the NTDS `PatientUUID` data element. The value can be used to find the linked PCR using the UUID attribute on the `PatientCareReport` data element in the NEMSIS data. Once the two records are joined via the NEMSIS UUID, data from both records can be accessed and used in analysis as if they were a single record.

Other Considerations

Linking Multiple EMS Records to a Trauma Record

Multiple EMS units may be involved in the EMS response to a patient during an incident (for example, rescue, scene transport, and interfacility transfer. Each unit creates its own PCR—and thus creates a unique PatientCareReport UUID for each record. System users may desire the ability for trauma registries to link multiple PCRs to a single trauma record. However, the 2021 NTDS standard only allows one PCR UUID to be recorded on a trauma record. When exporting data in NTDS format, trauma registry software should export the UUID from the PCR that represents the scene transport of the patient to the reporting hospital. If the patient arrived at the reporting hospital via interfacility transfer or non-EMS transport, the UUID should be "Not Applicable" in the trauma record. See the "EMS Patient Care Report Universally Unique Identifier (UUID)" page of the [2021 NTDS Data Dictionary](#) for more details.

Linking an EMS Record to Multiple Trauma Records

Using the 2021 NTDS data dictionary constraints, there should be a one-to-one match between an EMS PCR and a trauma record (that is, one PCR representing the scene transport to a hospital is linked to one trauma record from the hospital that received the patient from the transporting EMS agency). Multiple hospitals that cared for the same patient from the same incident may also desire to link the scene transport PCR to their trauma record as well, resulting in a scenario where the same EMS PCR has been linked to multiple trauma records. However, due to the requirements of the 2021 NTDS data dictionary, the other hospitals that cared for the patient should not include any PCR UUIDs in their trauma records when exported in NTDS format, because they did not receive the patient from the scene by EMS transport.

Unlinking an EMS Record from a Trauma Record

Trauma registry software should give trauma registrars the ability to unlink a PCR from a trauma record in case a mistake was made. When an unlink is done, the trauma registry software should remove the PCR UUID from the trauma record.

Handling EMS Record Updates After Linkage

EMS PCRs are usually finished long before their respective trauma records are created, but hospitals doing concurrent data entry may encounter a situation where a PCR was modified after it was initially linked to a trauma record. Since the UUID for the PCR never changes, this poses no issue for the use of

the UUID as the linkage key. However, if the trauma registry imports additional data from the PCR (such as EMS times, vital signs, etc.), then the trauma registry software should alert the registry user that the PCR data has been updated and provide an interface for the registrar to manage the process of re-importing the data from the PCR.

Linking EMS Records from NEMSIS Versions Prior to 3.5.0

PCRs created in versions prior to NEMSIS 3.5.0 do not support UUIDs (unless implemented as a custom element). For those PCRs, the unique key for a PCR is the combination of:

- dAgency.01 - EMS Agency Unique State ID
- dAgency.02 - EMS Agency Number
- dAgency.04 - EMS Agency State
- eRecord.01 - Patient Care Report Number

Trauma registries may implement linkage with pre-3.5.0 NEMSIS PCRs using that composite key as the identifier.

However, if a PCR does not have a UUID, no substitute value should be used in the NTDS `PatientUUID` data element. For example, the value of `eRecord.01` should not be used in `PatientUUID`, even if it happens to match the format of a UUID.

Sending Trauma Registry Data to the EMS Data System

Hospital outcome data is important to EMS for quality improvement. Trauma registries and EMS data systems should implement processes to send hospital outcome data from finished trauma records back to the EMS data system. The return data should include the PCR UUID. The EMS data system can use the UUID to look up the appropriate PCR and attach the outcome data to it.

The NEMSIS TAC has not recommended a method of data exchange or data format to use when transferring outcome data from a trauma registry to an EMS data system. Successful implementations have used the NEMSIS web services architecture and a custom NEMSIS-based XML format that only includes record identifiers and the eOutcomes section, in HL7 version 2 admit-discharge-transfer (ADT) messages, or using HL7 Fast Healthcare Interoperability Resources (FHIR).

Conclusion

The NEMSIS UUID provides a precise way to link a trauma record to an EMS PCR. By developing automated data exchange between EMS and trauma data systems, software developers can help trauma registrars save time by importing EMS data rather than transcribing it into trauma records. At the same time, high quality linkage results are ensured by including the trauma registrar in the process of determining the correct PCR to link to each trauma record. Accurately and efficiently linked EMS and trauma data sets will enhance research capabilities and lead to insights that improve treatment of injured patients.