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7-18-2019

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Recommended Citation

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Abstract

The Emergency Care System (ECS) in the United States provides immediate unscheduled care to an increasing number of patients annually. Every ECS patient encounter generates data in a myriad of unlinked systems at regional emergency services and hospitals. Often, patients' prior health records are not available in a timely manner, fragmented, or not found. To address availability and interoperability of data relevant to emergency care, the Health Level Seven (HL7) Emergency Care Workgroup collaborates to ensure evolving health data interoperability standards incorporate ECS considerations. Foundational to that effort is a comprehensive model of Emergency Care information, the Emergency Care Domain Analysis Model (EC-DAM).

The EC-DAM interlinks models of controlled vocabulary, information artifacts, health record functions and emergency department workflow. This poster describes the design considerations and the impact of the EC-DAM on related information standards such as FHIR resources in prehospital care, trauma care, disease surveillance, and clinical research. The EC-DAM provides an integrated, standardized platform for creation of interoperable EC related computable knowledge tools. This poster presentation is particularly relevant to developers of health information standards and health information systems that involve the ECS.

Background

- The U.S. Hospital Based Emergency Care system manages 140 million annual visits in a high risk, low information environment.
- The Emergency Care (EC) system greatly benefits from shared knowledge resources.
- Health Level 7 (HL7) is the ANSI accredited Standards Development Organization for healthcare information interoperability specifications.
- The HL7 Emergency Care Workgroup (ECWG) provides oversight to information standards impacting EC.
- The ECWG developed the EC Domain Analysis Model (EC-DAM) to coordinate standards for sharing knowledge resources impacting EC practice.
- The EC-DAM provides a model framework of EC data, workflow and information systems functions for use in implementing EC related knowledge resources such as protocols, clinical scoring, FHIR resources, and clinical guidelines.
- We describe the EC-DAM and present a simple example of use.

Methods

- HL7 Standards development through open, consensus processes, procedures and policies based on established an Governance and Operations Manual
- HL7 Domain Analysis Modeling Process outlined in reference 1
- The data model for the EC-DAM is the Data Elements for Emergency Department Systems (McClay 2015)
- The information model is compiled from HL7 Clinical Elements Models and the Version 3 Reference Information Model
- The EC Business Process Model is the result of consensus input from EC informatics experts, ED IS vendors and HL7 modelers
- The Emergency Department Information System Functional Profile is derived from the HL7 Electronic Health Record Functional Model (Hammond 2008)
- The components of the EC-DAM were utilized to model capture of the Glasgow Coma Scale in stroke assessment protocols for this demonstration

Results

- HL7 Emergency Care Domain Analysis Model integrates information standards for data, information modeling, workflow and information system functions
- The EC-DAM framework supports interoperable modeling of Information System requirements to support clinical processes involving hospital based emergency departments.
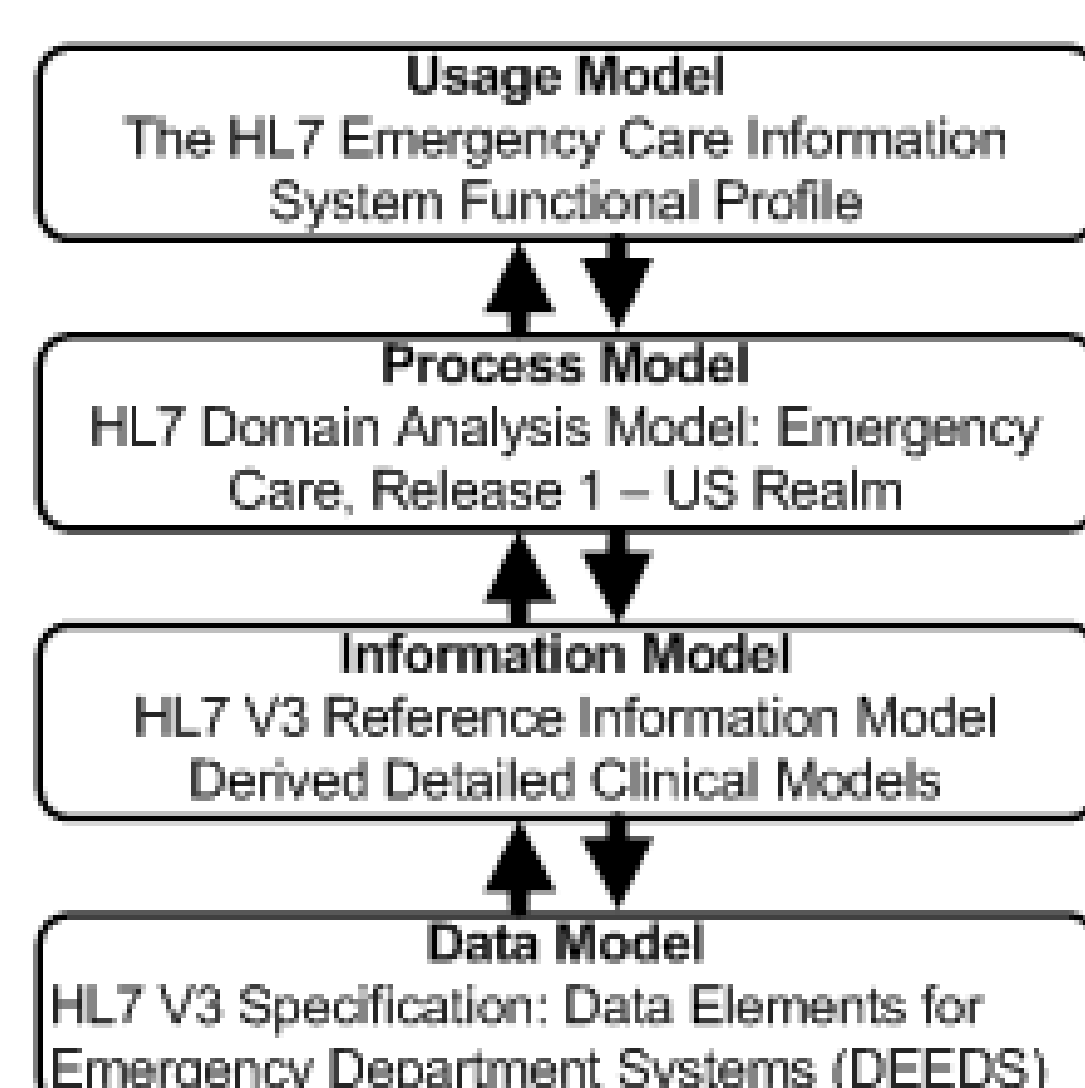

Figure 1: Component Models of EC-DAM: Integration of standards for represent EC information.

"The nice thing about standards is that you have so many to chose from"
- Andrew S. Teanenbaum, Computer Networks, 1981, p168

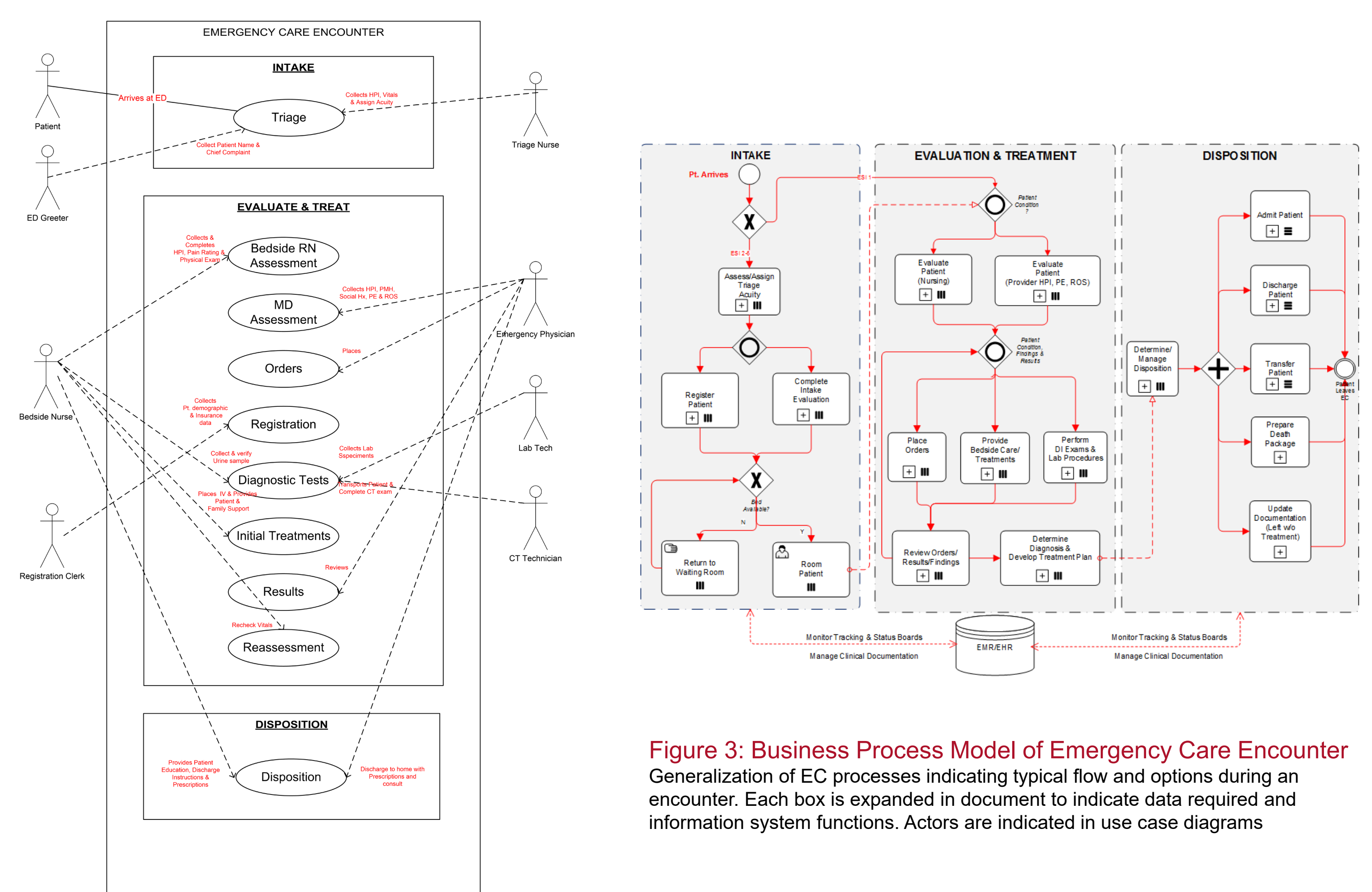## The Emergency Care Domain Analysis Model

Figure 2: Example EC-DAM Use Case Diagram
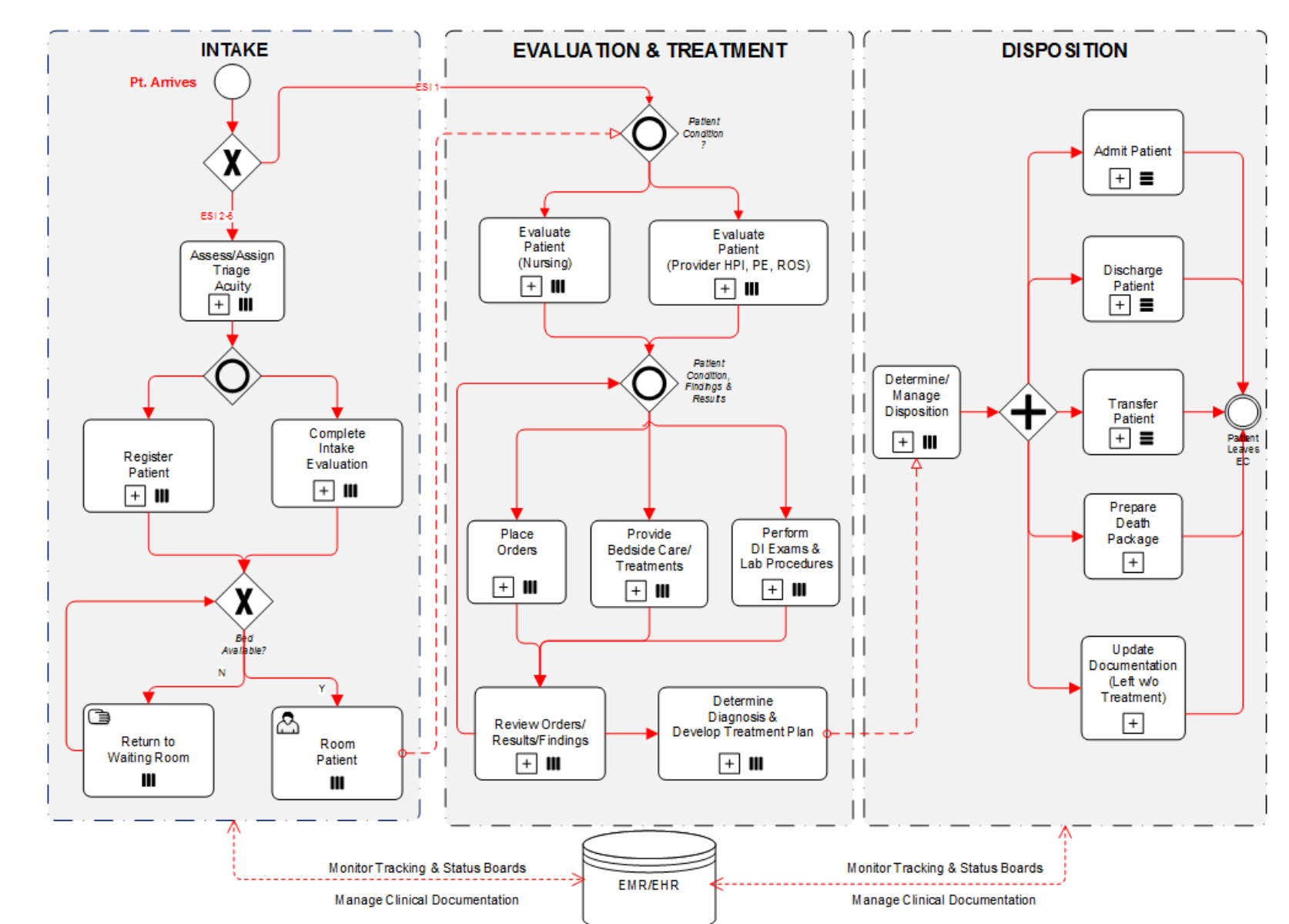Showing actors and activities in emergency care encounter

Figure 3: Business Process Model of Emergency Care Encounter
Generalization of EC processes indicating typical flow and options during an encounter. Each box is expanded in document to indicate data required and information system functions. Actors are indicated in use case diagrams
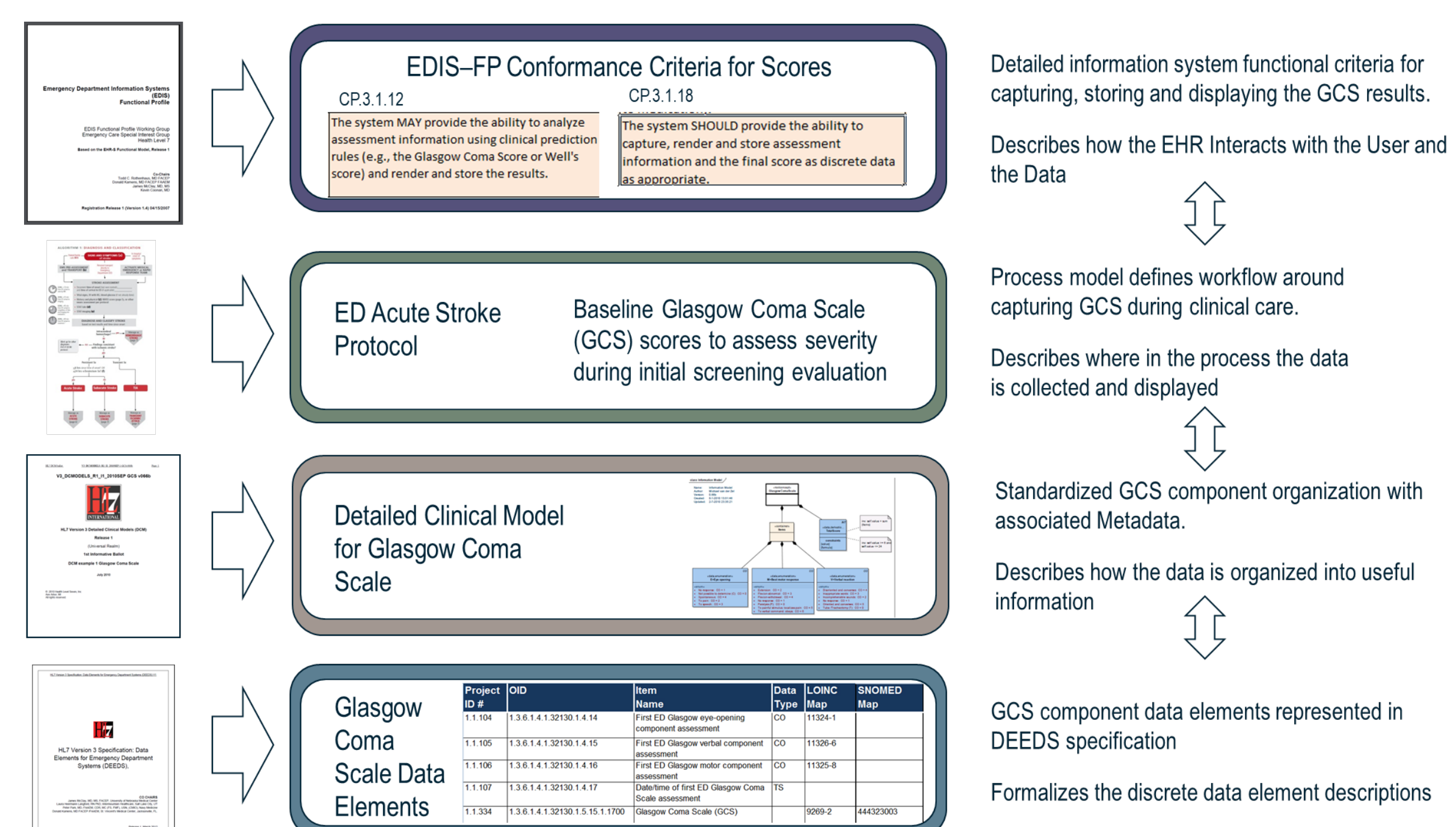
Application of EC-DAM in stroke protocol

Figure 4: EC-DAM components for GCS in stroke: Inter-relationship of components of EC DAM in creating a scoring tool for Glasgow Coma Scale. Data Elements from DEEDS, information model from CIMI, workflow model for stroke, information system components for tool.

Discussion

- Large scale deployment of interoperable knowledge artifacts depends on a shared set of models for data, process and usage.
- The HL7 Domain Analysis Modeling Process provides a framework for integrating and extending existing clinical interoperability standards across different clinical domains
- The EC-DAM represents one of a family of HL7 domain analysis models representing a spectrum of clinical conditions.
- The open, consensus development process allows free adoption and reuse of standards by the knowledge management community

References

HL7 Clinical Interoperability Council, "HL7 Specification: Domain Analysis Model Specifications and Requirements - Canonical Definition, Release 1" (2017) http://www.hl7.org/implement/standards/product_brief.cfm?product_id=463 (accessed 6/29/2019)

HL7 Emergency Care Workgroup, "HL7 Domain Analysis Model: Emergency Care, Release 1 – US Realm" (2016) http://www.hl7.org/implement/standards/product_brief.cfm?product_id=421 (accessed 6/29/2019)

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