



# Clinical Decision Support

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# Clinical Decision Support

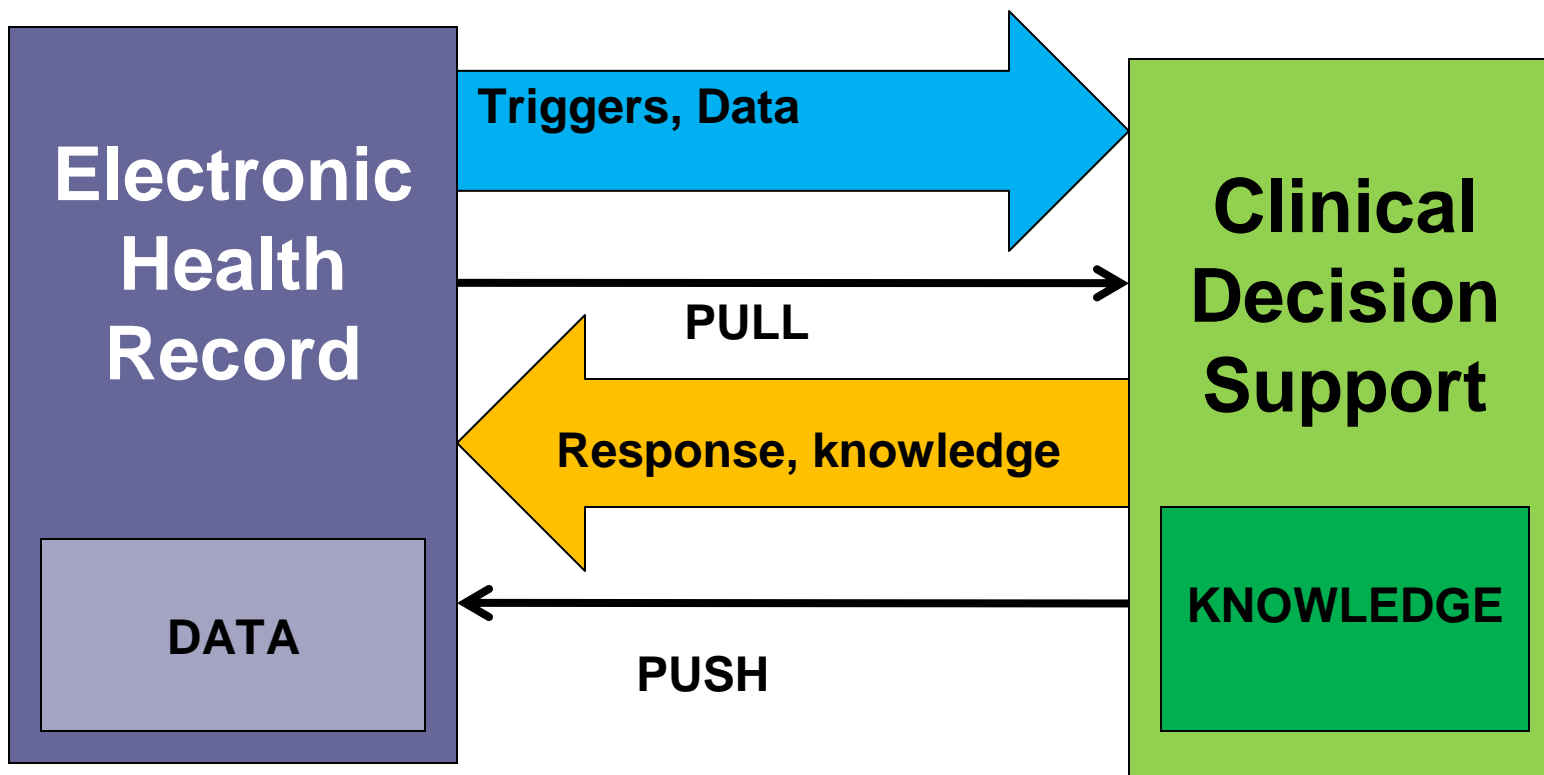
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- Clinical decision support (CDS) systems **apply information technology to address, in a systematic manner, questions** (and other information needs) that arise during patient care and clinical research.
- Developers and users of CDS systems seek to **improve clinical and public health outcomes.** CDS can inform and alter healthcare decisions, and standardize decisions and procedures for clinical research.



# Link between data and knowledge

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# Decision Support Service (DSS)

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- Business Purpose
  - Facilitate implementation and maintenance of CDS applications
- Functionality
  - Evaluate patient data using knowledge modules and returns machine-interpretable conclusions
- Collaboration:
  - HL7: Clinical Decision, SOA, and Structured Documents Work Groups
  - Object Management Group, NIH (NCI)
  - Morningside, CDS Consortium



# Logical component: Order Sets

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- An order set is a functional grouping of orders in support of a protocol that is derived from evidence based best practice guidelines.
  - Order sets have a specific purpose.
  - Order sets may contain conditional logic.
  - Some items in an order set may be fully specified, others may have more optionality.
  - Order sets may be part of a larger care plan.



# Logical component: Arden Syntax

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- Arden Syntax is an HL7/ANSI Standard; current version 2.7
- Arden Syntax arose from the need to make medical knowledge available for decision making at the point-of-care
- Make the knowledge and logic explicit
- Allow sharing within and between institutions
- Standardize the way medical knowledge is integrated into health information systems



# Arden Syntax v2.8 (Future state)

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- Introduces “fuzzy logic” (moderately severe, possibly associated)
- XML: Arden Markup Language
- Support Complex Clinical Guidelines
- Enhanced structured outputs
- Address uncertainty
- More ...



# GuideLine Interchange Format (GLIF)

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- A format for sharing clinical guidelines independent of platforms and systems
- Based on a object-oriented logical model of concepts
- Has an XML-based syntax
- GLIF is evolving as an open standard



# GLIF Model

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- Flowchart representation of a temporal sequence of clinical steps
- Guideline has title and author
- Guideline Step
  - Action step
  - Decision step
  - Branch step
  - Synchronization step
  - Patient sleep step

# Abstract Machine Representation

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- Unambiguous syntax for logical expressions based on Arden Syntax
- All logical expressions & actions refer to defined concepts (medical ontology)
- Allowed values, ranges, and time constraints
- Can be interpreted and analyzed for correctness
  - Syntax, type, and range checking



# GELLO: Common Expression Language

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- Executable language for expressing logical rules and queries in CDSS
- Object-oriented
- Used to
  - Build up queries to extract and manipulated data from EHRs
  - Construct decision criteria by building up expressions to reason about particular data features/values such as guidelines
  - Create expressions, formulae, and queries for applications within other HL7 standards



# Expression Language

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- Used for specifying decision criteria and deriving summary values
- Provides basic built-in data types, assuming an underlying data model virtual medical record (vMR) that is a refinement of the HL7 RIM
- Major problem to sharing clinical knowledge is lack of common format for data encoding and manipulation



# Infobutton Manager

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- Software that supports implementation of Infobuttons in an application independent manner.
- The application passes parameters to the Infobutton Manager which generates an HTML document with a set of natural language questions that are hyperlinks to clinical information resources.



# Quality Indicators

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- **IF** a vulnerable elder has had a myocardial infarction, **THEN** he/she should be offered a beta blocker unless there is a contraindication.
- **IF** an ambulatory vulnerable elder has an osteoporotic fracture diagnosed, **THEN** physical therapy or an exercise program should be offered within 3 months.
- **IF** a vulnerable elder is taking warfarin for atrial fibrillation, **THEN** an INR should be checked at least every 6 weeks.



# Healthcare Quality Measure Format

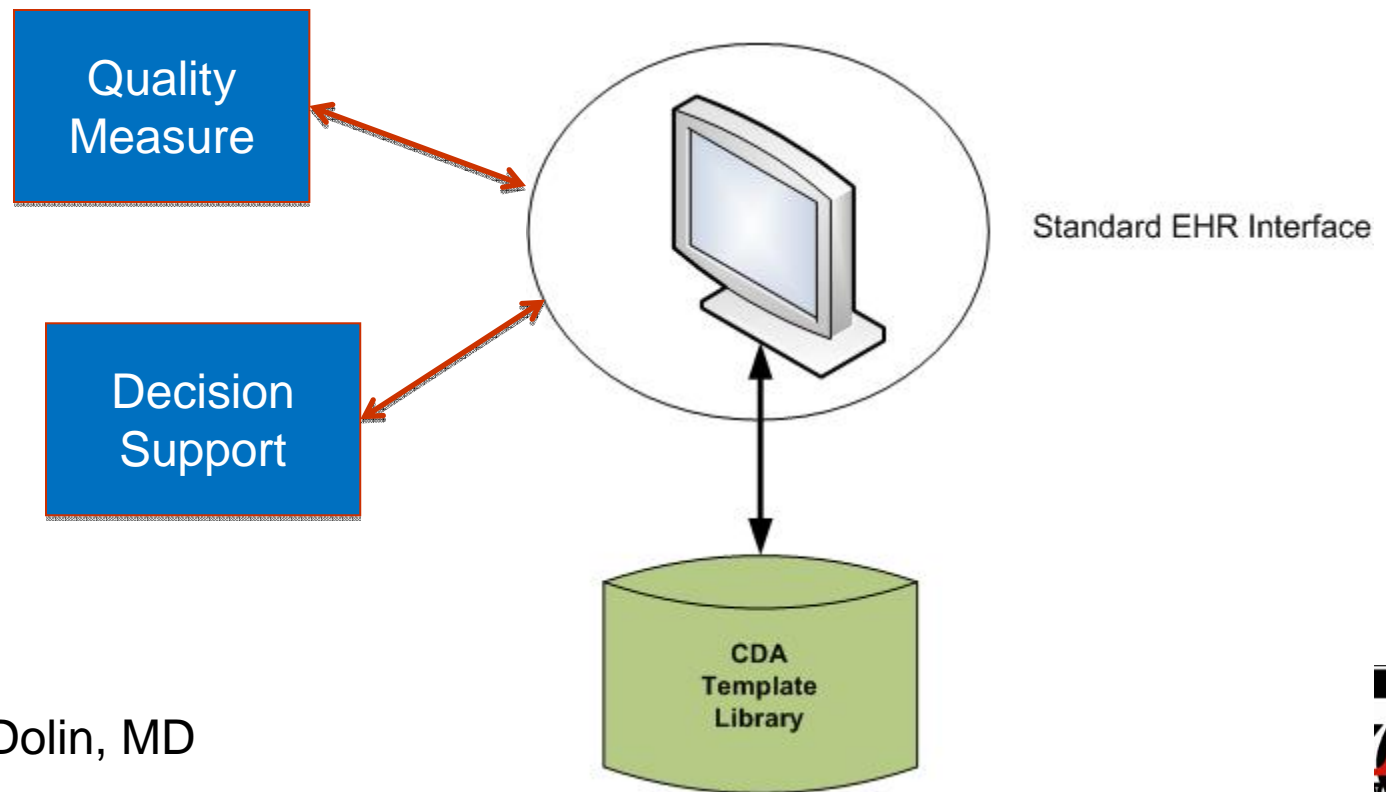
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- For clinical performance measures
- Used by CMS for incentive payments
- Algorithm in computable form
- Need to collect digital data in structured format
- Working with AMA Collaborative



# CDA for CDS: Leveraging Templates

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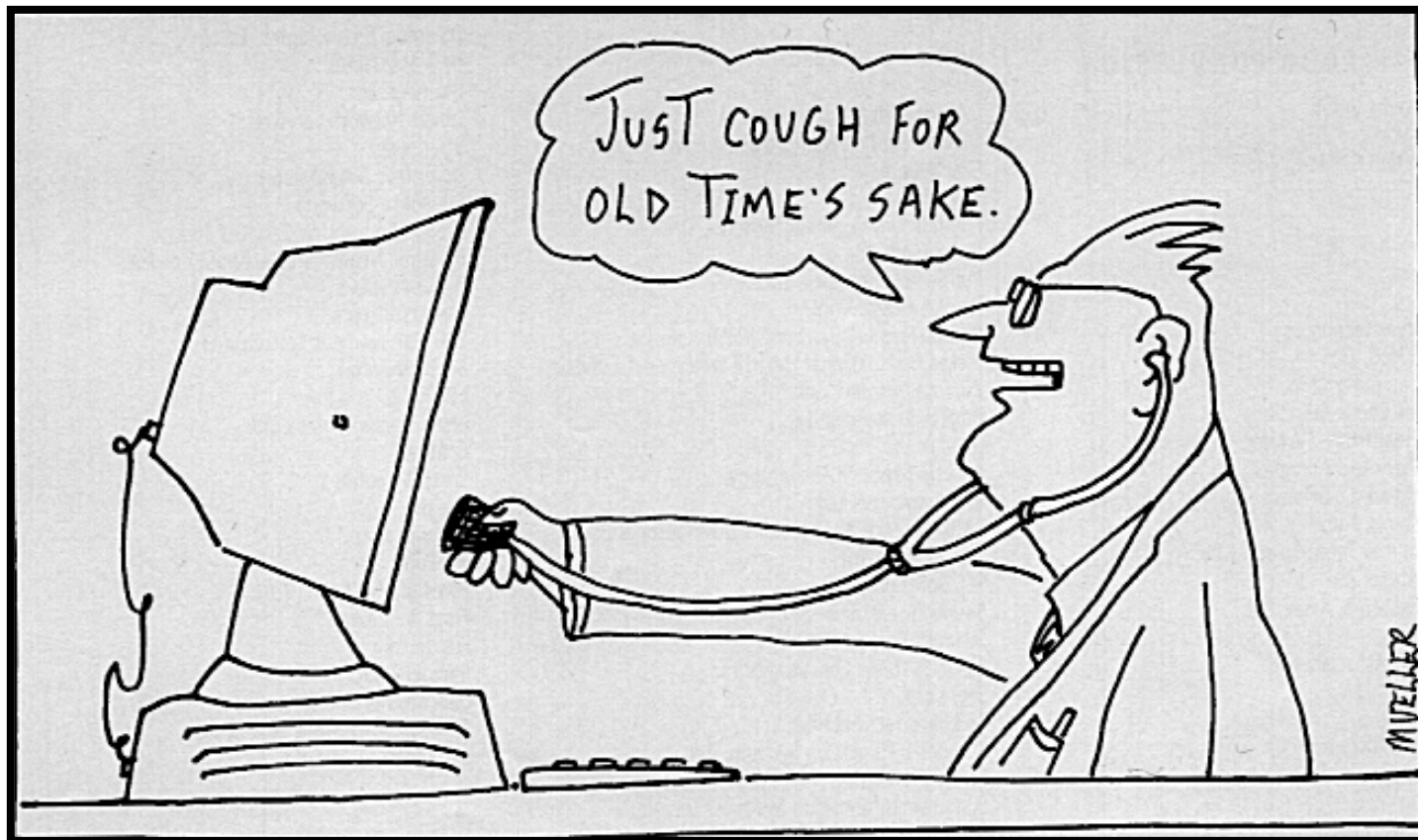


Source: Robert Dolin, MD



# Thanks

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# Special Thanks

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A Special Thanks to  
Dr. Ed Hammond  
Dr. Bob Dolin

