

# Detailed Clinical Models for Sharable, Executable Guidelines

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# Roadmap

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- *What is SAGE?*
- *Sharing guideline information*
  - *Challenges*
  - *Solutions*



# What Is SAGE?

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- *Standards-based, Active Guideline Environment*
- *NIST ATP Grant*
- *Apelon, IDX, IHC, Mayo Clinic, Stanford, UNMC*



# What Is SAGE?

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- *Standards-based*
  - *Leverage existing standards*
  - *Help create new standards*
  - *Goal: shareable guidelines*
- *Active*
- *Guideline*
- *Environment*



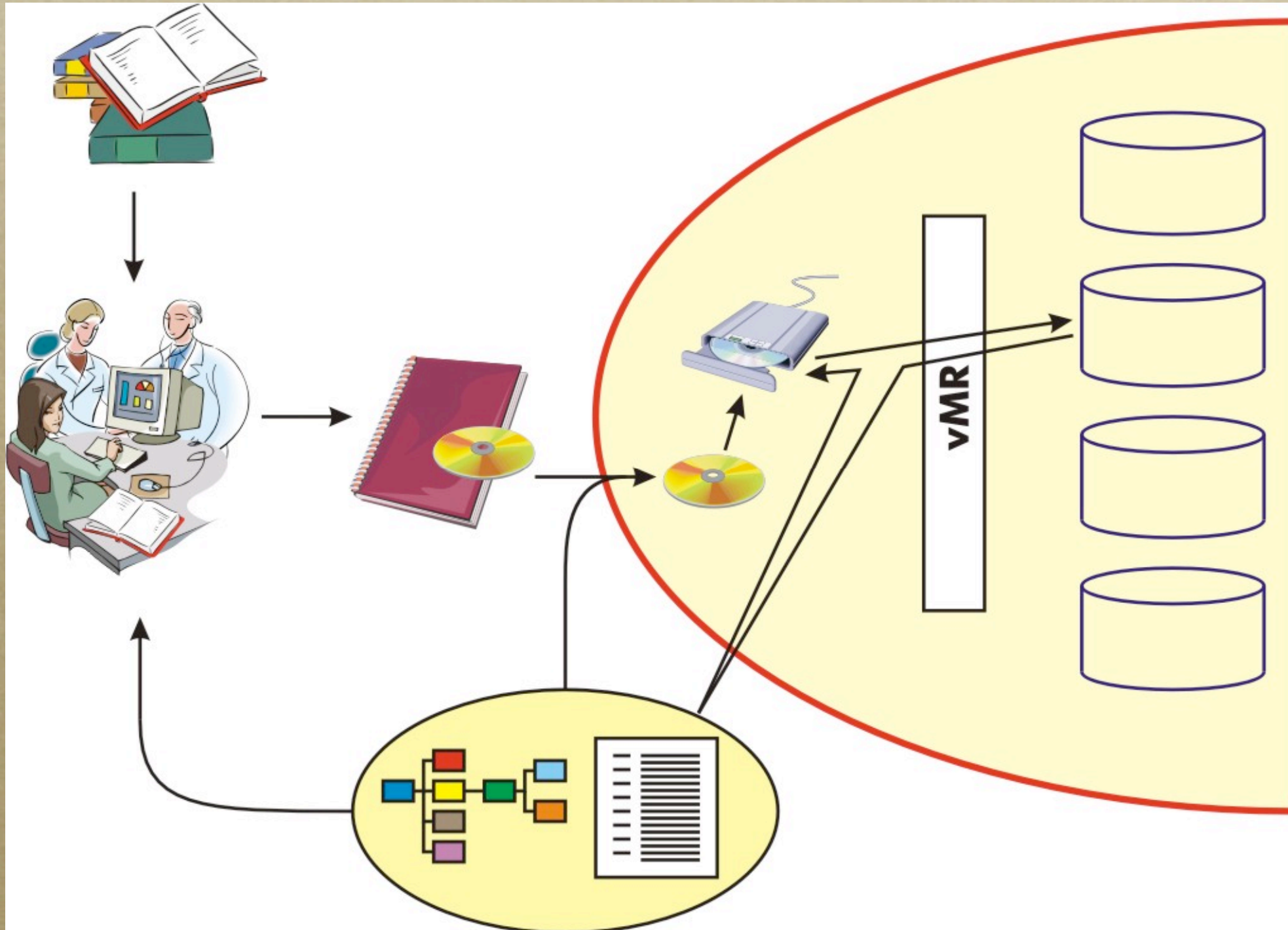
# What Is SAGE?

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- *Standards-based*
- *Active*
  - *Executable*
- *Guideline*
- *Environment*



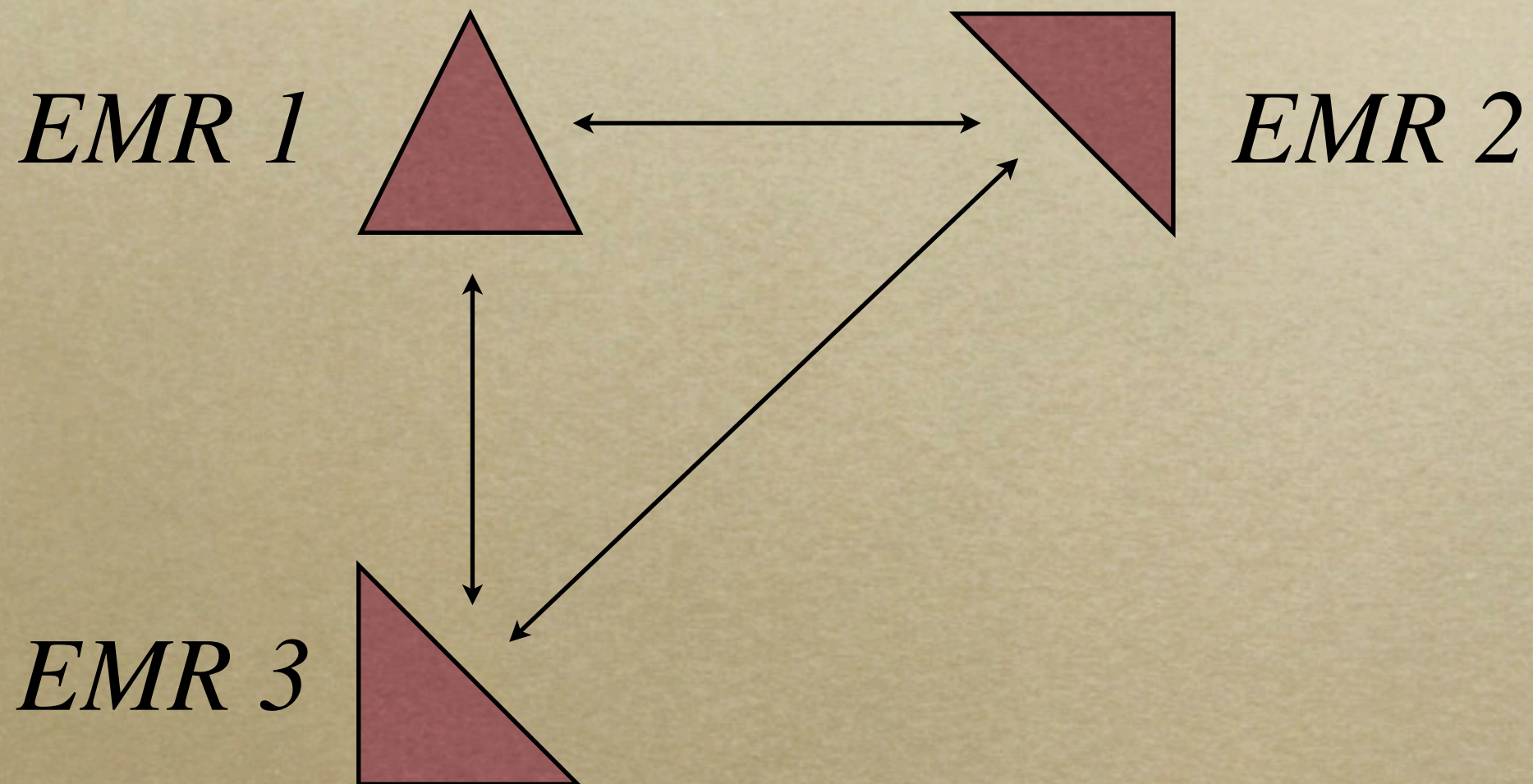
# SAGE Overview





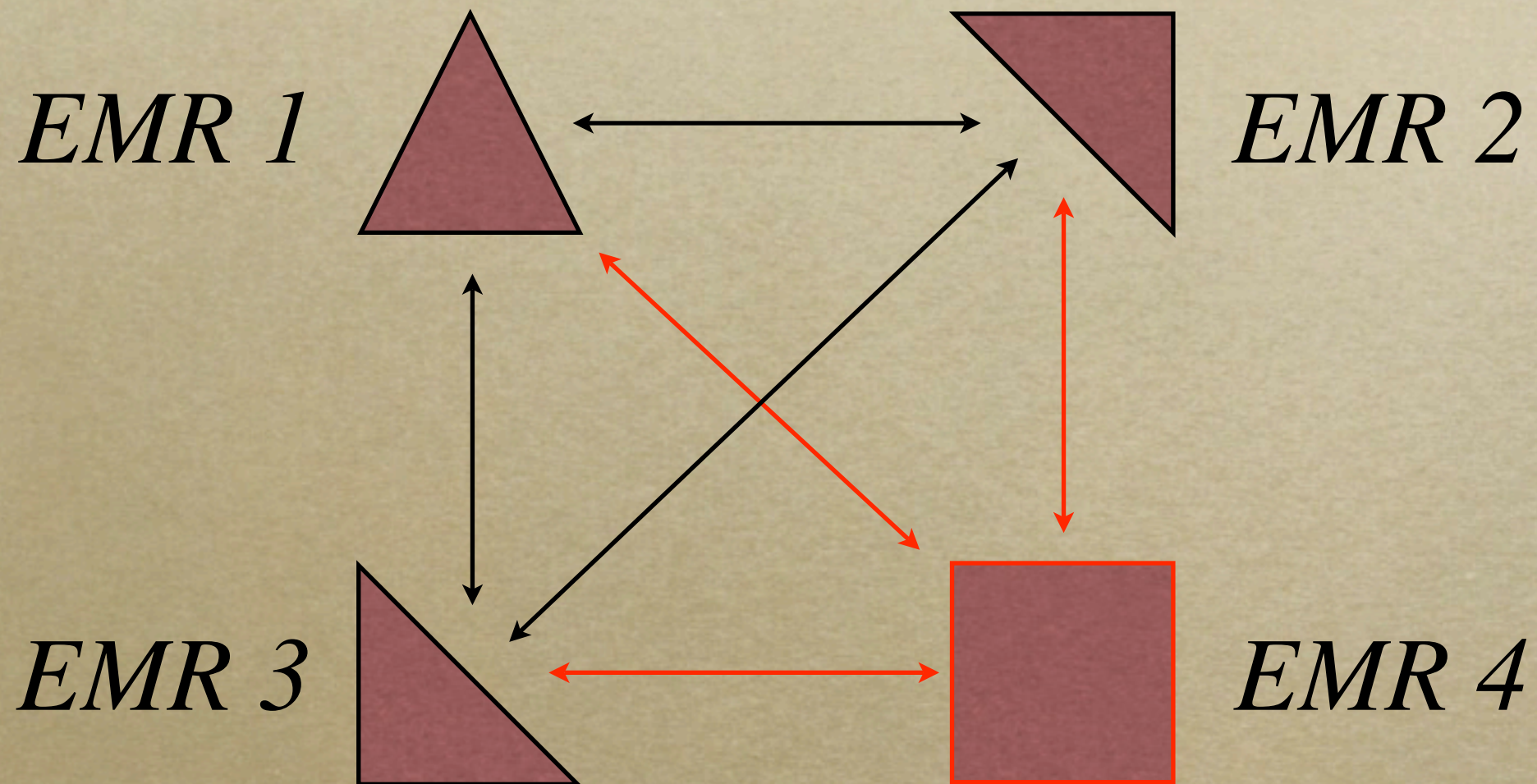
# Multiple EMRs, Multiple Mappings

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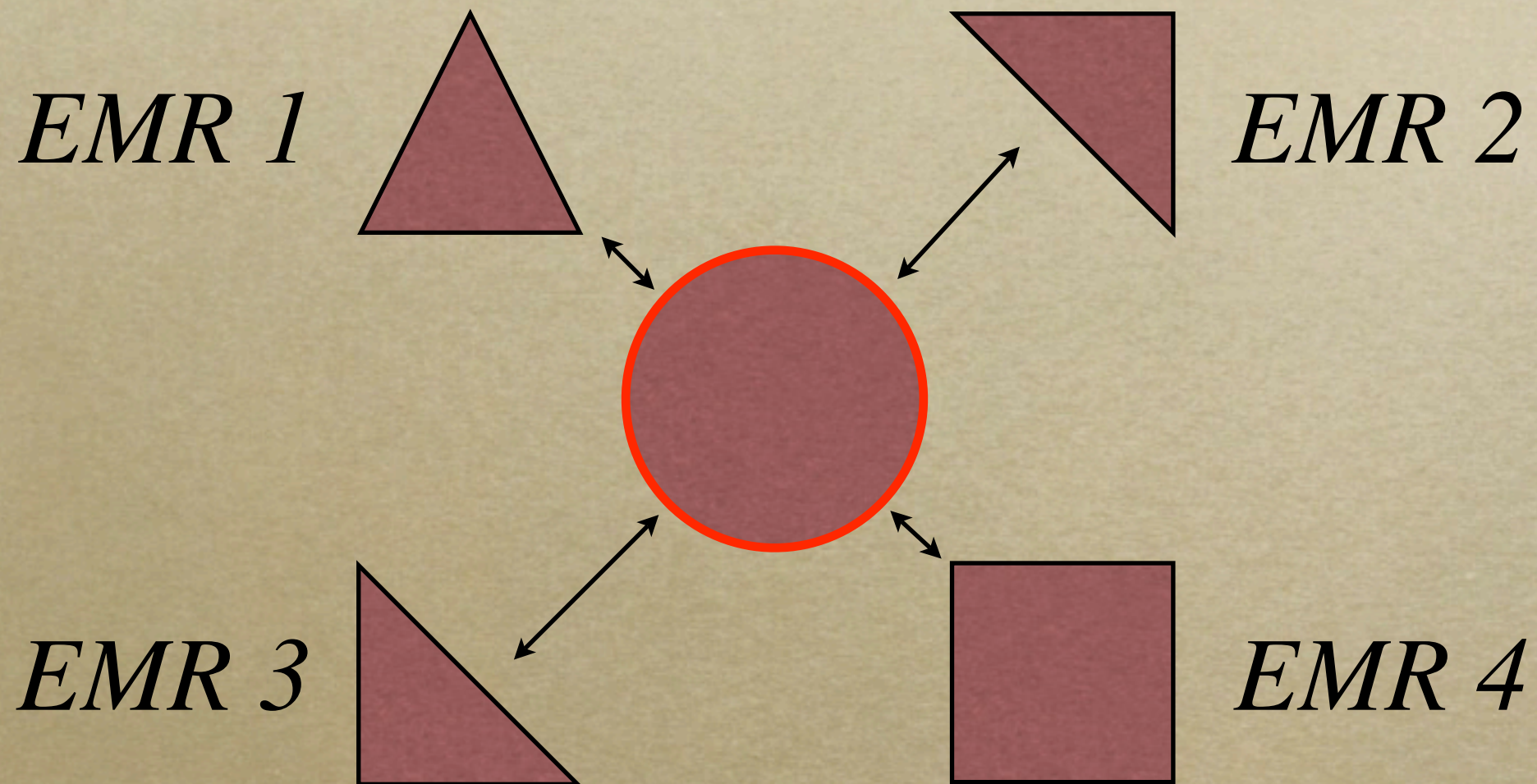
# Mappings Grow Exponentially





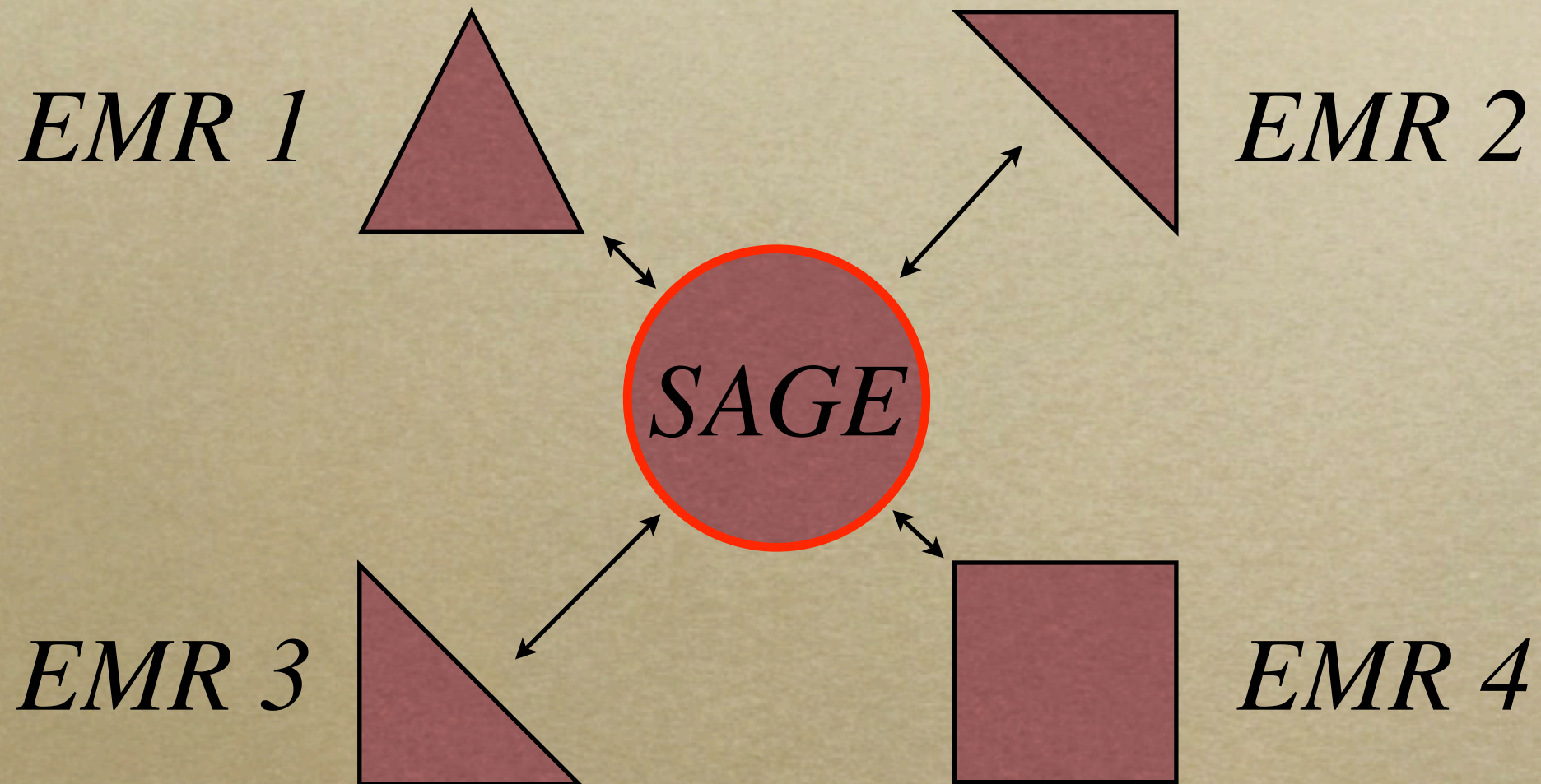
# Standard, Shared Representation

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# For Guidelines





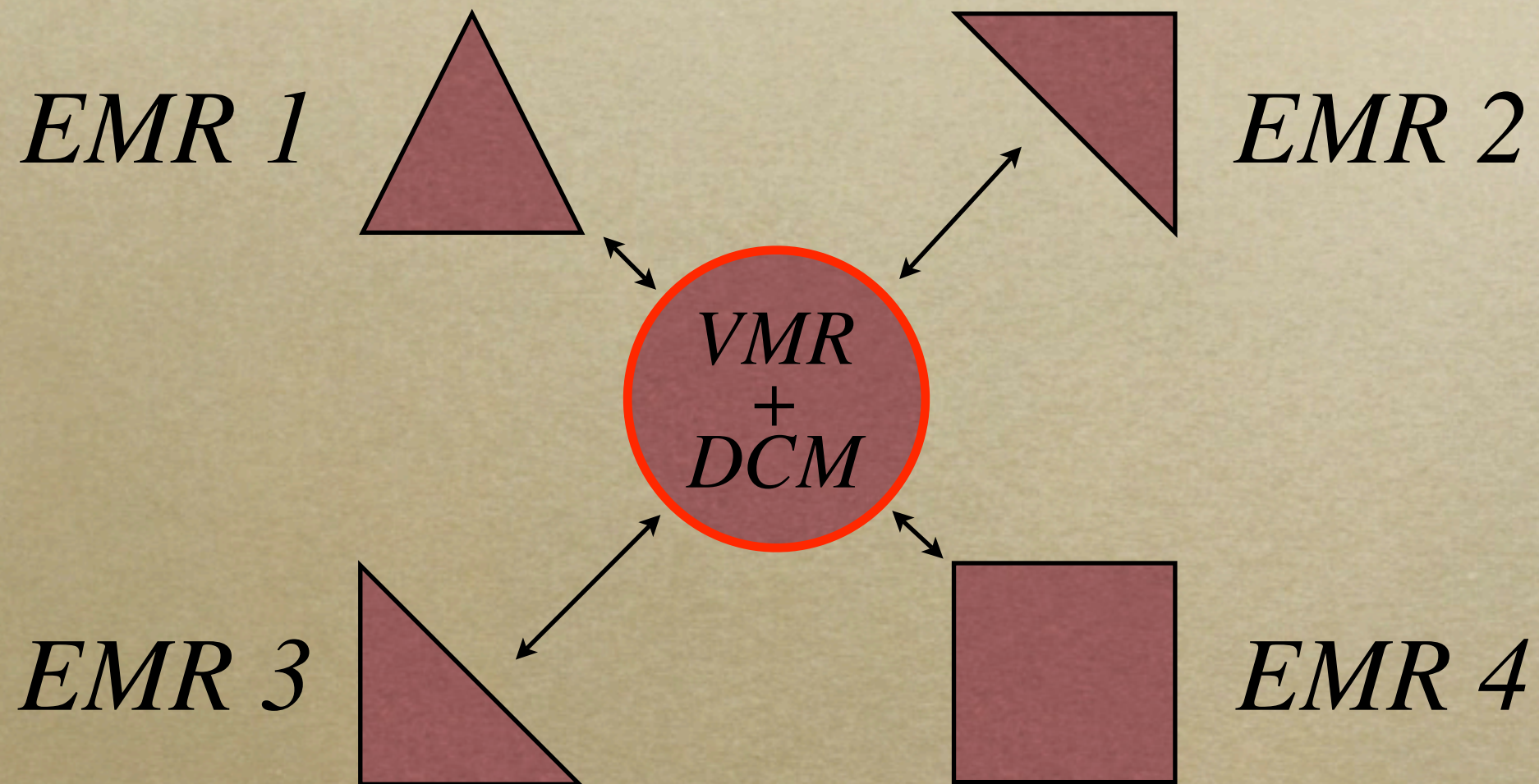
# What Needs to Be Sharable?

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- *Logic*
  - *E.g. Arden Syntax (procedural)*
  - *SAGE guideline format (declarative)*
- *Data (focus of this presentation)*
  - *Curly braces in Arden Syntax*
  - *VMR + Detailed Clinical Models in SAGE*



# For Data in Guidelines





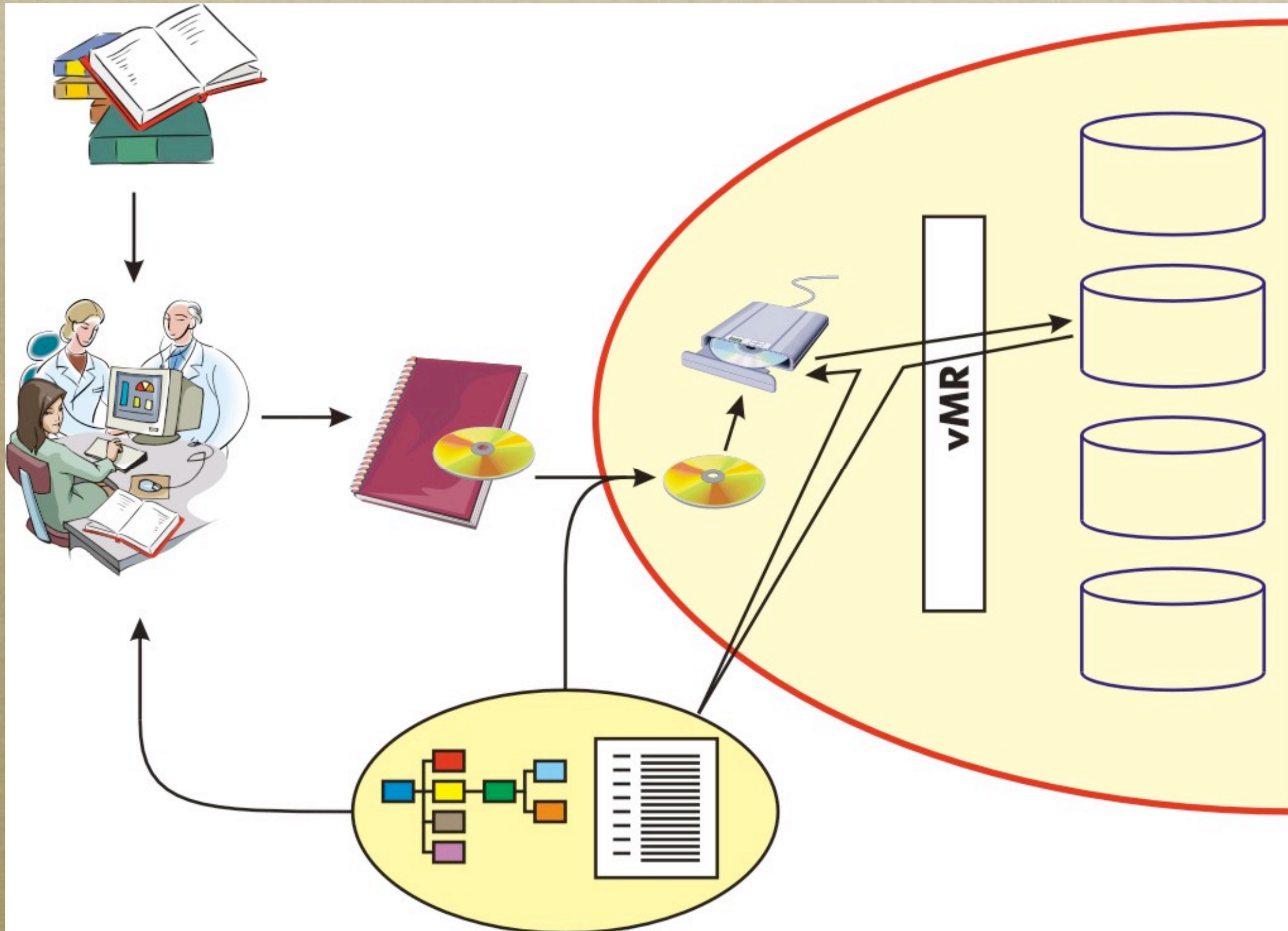
# What Is the VMR?

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- *Virtual Medical Record*
- *A small set of classes corresponding to the broad types of clinical data needed for guideline execution*
- *Classes defined on an as-needed basis*
- *Based on other existing standards (HL7 RIM) where possible*



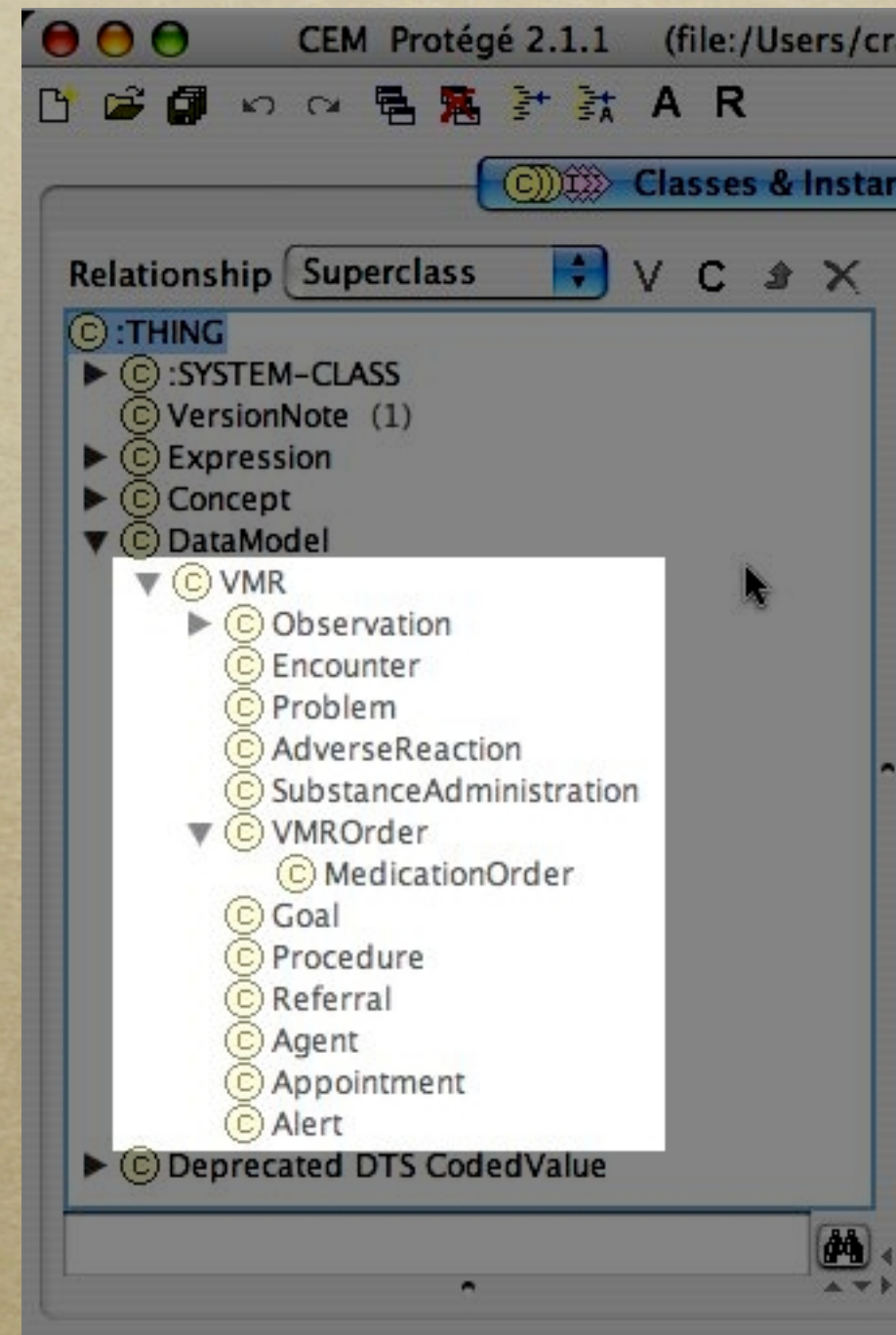
# Virtual Medical Record





# VMR in Protege

- *13 Classes (currently)*
- *Relatively flat inheritance hierarchy (currently)*
- *Designed to meet specific needs of specific guidelines*





# VMR Observation Class

The screenshot shows the CEM Protégé 2.1.1 interface. The title bar indicates the file path: (file:/Users/craig/Desktop/Current\_SAGE\_Stuff/CEM20040107%20Folder/CEM.pprj, Standard Text Files). The main window has a toolbar with icons for Classes & Instances, Classes, Slots, Forms, Instances, and Queries. The 'Classes' tab is active, showing the 'Observation' class (type=:STANDARD-CLASS).

**Relationship** Sup... V C X

- :THING
  - :SYSTEM-CLASS
  - VersionNote
  - Expression
  - Concept
  - DataModel
    - VMR
      - Observation**
      - Encounter
      - Problem
      - AdverseReaction
      - SubstanceAdministration
      - VMROrder
        - MedicationOrder
      - Goal
      - Procedure
      - Referral
      - Agent
      - Appointment
      - Alert
    - Deprecated DTS CodedValue

**Observation** (type=:STANDARD-CLASS) C X

Name	Documentation	Constraints
Observation		

**Role** Concrete

**Template Slots** V V C X + -

Name	Type	Cardinality	Other Facets
value	Instance	required single	classes={Expression}
code	Instance	required single	classes={CodedValue,ConceptExpression}
text	Instance	single	classes={EncapsulatedData}
interpretationCode	Instance	single	classes={SetOfCS,ConceptExpression}
effectiveTime	Instance	single	classes={TimeInterval}
subject	Instance	single	classes={CodedValue,ConceptExpression}
encounter	Instance	single	classes={Encounter}
methodCode	Instance	single	classes={SetOfCE,ConceptExpression}

**Superclasses** + -

- VMR



# Do We Need More Than a VMR?

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- *It describes broad areas of guideline related information*
- *It enables representations of clinical information*
- *It does not constrain or validate except at the coarsest level*



# Too Many Ways to Say the Same Thing

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*A single name/code and value*

*Left patellar deep tendon reflex intensity is 2+*

*Combination of two names/codes and values*

*Patellar deep tendon reflex intensity is 2+*

*Laterality is left*

*Combination of three names/codes and values*

*Deep tendon reflex intensity is 2+*

*Body part is patella*

*Laterality is left*



# Too Many Ways to Say the Same Thing

*A single name/code and value*

*Left*

*is 2+*

*Comb*

*ues*

*Pate*

*+*

*L*

*All of these examples  
can be represented by  
a single VMR*

*Comb*

*ues*

*Dee*

*Body part is patera*

*Laterality is left*



# Detailed Clinical Models

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- *Specializations of VMR classes*
- *Define boundary between terminology and information models*
- *Similar to (if not the same as):*
  - *Archetypes*
  - *Templates*
  - *Clinical Statements*



# Pseudocode DCM Example

```
Reflex constrains vmr.Observation {
  code.equals("reflex finding")
  value.isa(reflex_finding_value_set)
  hasQualifier {
    code.equals("body part")
    value.isa(body_part_value_set)
  }
  hasQualifier {
    code.equals("laterality")
    value.isa(laterality_value_set)
  }
}
```



# What Do We Gain?

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- *Preserve modeling decisions across guidelines*
- *Can be used as a catalog of the data used in a guideline*
- *A shareable definition of a clinical entity*



# Priorities

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- *Internally consistent*
- *Pragmatic - The ideal separation of information and terminology models was not always supported by:*
  - *Our chosen terminologies*
  - *Our information model*
  - *The real underlying EMRs*
    - *If every EMR stores the concept “no family history of breast cancer” what do we gain practically from using a post-coordination?*
- *Elegant*



# Status of DCMs in SAGE

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- *Currently:*
  - *Defines boundary between terminology & information models*
  - *Specify appropriate value sets*
- *In the future:*
  - *Aggregation*
  - *Qualification*



# Conclusion

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- *We have implemented a method for sharing data needed for representing clinical guidelines by:*
  - *Designing an abstraction of specific EMRs (the VMR)*
  - *Defining specializations of this abstraction (Detailed Clinical Models)*



# Thank You

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- *<http://www.SageProject.net>*