Utrecht University

Faculty of Science
Department of Information and Computing Science
Master of Business Informatics

Seminar Medical Informatics

Electronic Health Record

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Agenda for today

EHRs

- What is EHR?
- From the paper-based patient record to EHR
- Types of EHR
- Essential components
- Healthcare information models
- International Reference Standards
    - ISO 13606 Standard

Discussion about: EHR: the inflection point of medicine

Assignment for next March 4th: Preparation for Electronic Health Record Workshop

Guest lecture: Care2Report by Prof. Dr. Sjaak Brinkkemper

What is EHR?

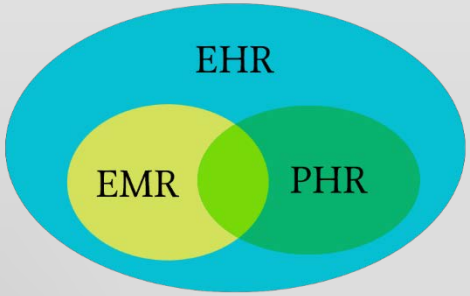
"An electronic record of health-related information on an individual that…

EHR (Electronic Health Record): "*…conforms to interoperability standards and that can be created, managed and consulted by authorized clinicians and staff across more than one healthcare organization"*

EMR (Electronic Medical Record): *"…can be created, gathered, managed and consulted by authorized clinicians and staff within one healthcare organization"*

PHR (Personal Health Record): *"…conforms to interoperability standards and that can be drawn from multiple sources while being managed, shared and controlled by the individual"*

(U.S. National Alliance for Health Information Technology)



Objectives of EHR

- Decrease access and delivery times
- Share the data between actors involved in the care process
- Meet the needs of security and audit trail
- Avoid medical errors

around 100,000 American citizens die each year of medical errors

- Provide data for biomedical or public health research, for teaching purpose or for management

Added value of the EHR compared to paper-based patient records

Health Information Exchange

- Data integration (including multimedia data)
- Global data availability
- Readiness
- Completeness
- Simultaneous access
- Remote access
- Linking the episodes of care

Data Protection, Security and Traceability

- Data security
- Confidentiality (-)

Decision Support

- Reminder and alarm
- Diagnosis and therapeutic decision support

Secondary Reuse of the Patient Data

- Professional practice assessment
- Biomedical and epidemiologic research
- Management

Teaching Activities

- Process of care
- Acceptance of care protocols
- Link to knowledge database

Types of Health Record Systems

- EMRs in Primary Care Facilities
- EMRs in the Hospital or Specialties Center
- Shared EMRs and Personal Health Records (PHRs) → EHR
- Pharmaceutical Record

Essential EHR Components

- Administrative processes
- Communication and connectivity
- Decision support
- Dentistry and optometry
- Health information and data
- Order-entry management
- Patient support
- Results management
- Population health management

Healthcare Information models

Mr. Alain DuPont
Came on Friday 19 h for an emergency!
Another angina!
Red throat
Clamoxyl 1gx2 6 days
No certif this time

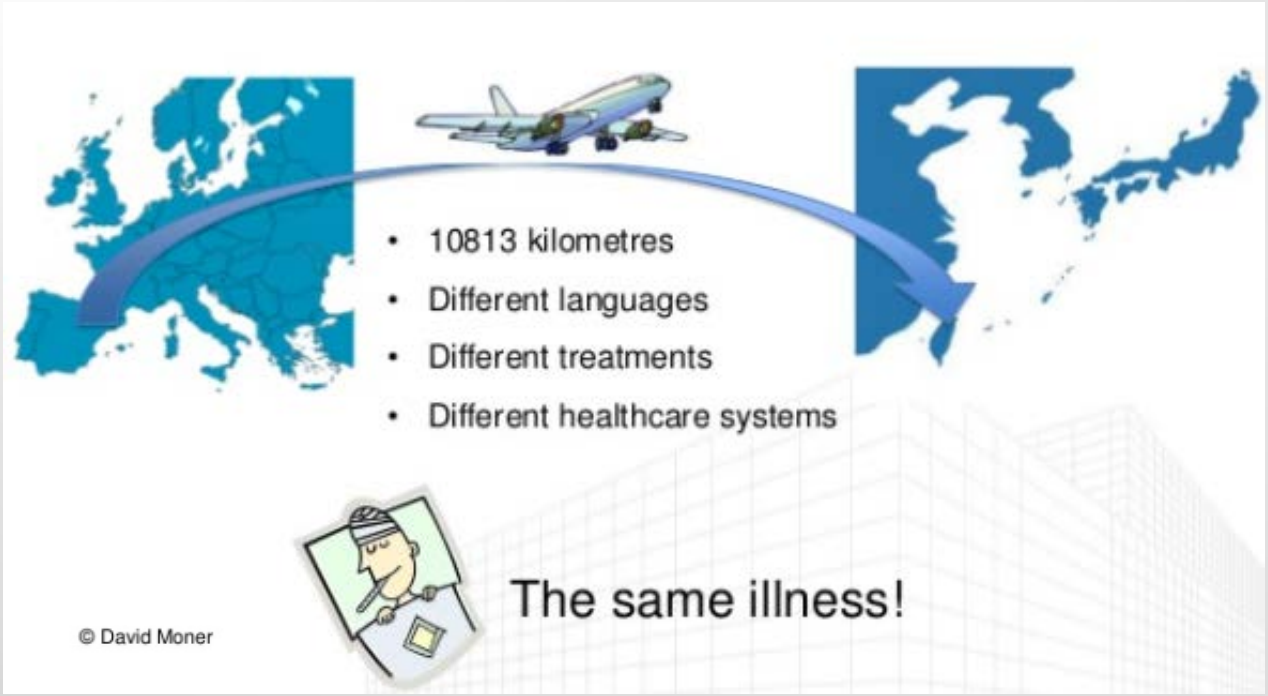
Healthcare Information models: Levels of data structuring

• **Level 1** (unstructured data): the format of the clinical documentation is human readable free-text

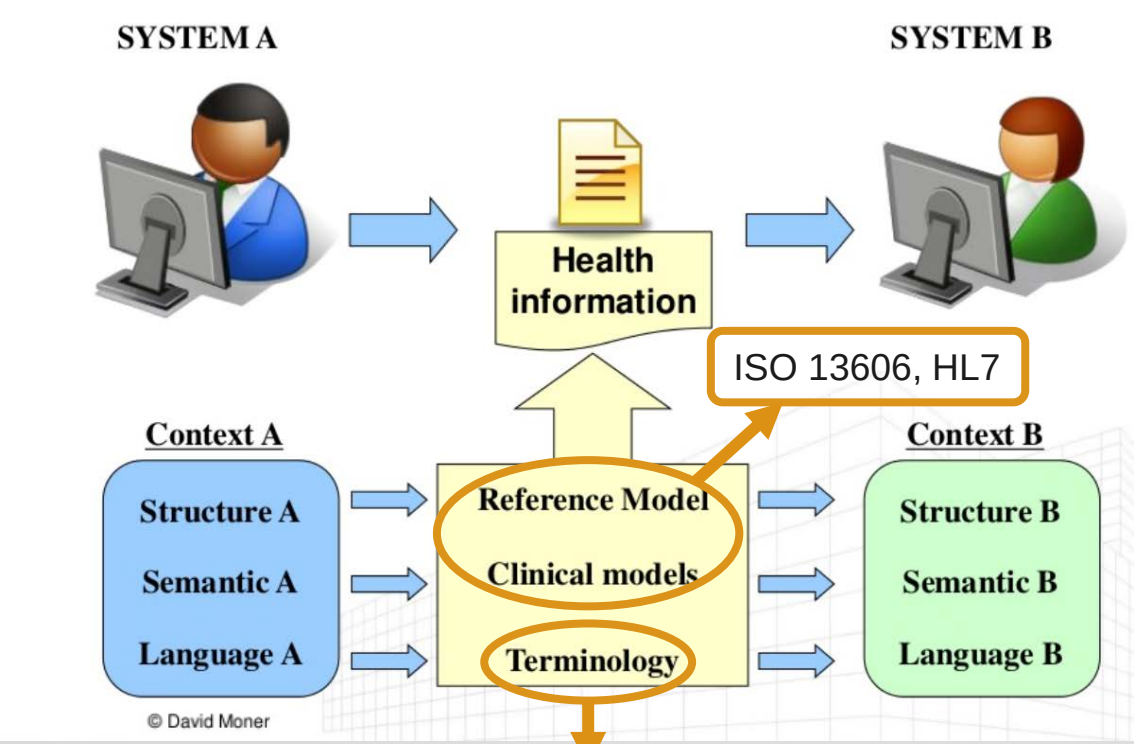
• **Level 2** (semi-structured data): the format of the clinical documentation consists in one or more structured sections. Each section contains a single narrative block.

• **Level 3** (structured data): the format of the clinical documentation allows each section to include machine-processed clinical statements at almost any level of granularity.

What happens if I need my EHR in other part of the world?



What we need to share EHR data between two different EHR systems?



International reference standards

Objective: Semantic interoperability between diverse systems

Main standards in the domain of patient care:

- CEN/ISO EN 13606 (OpenEHR foundation): Generic and comprehensive representation for the exchange of EHR information (including fine-grained parts of EHR)
- HL7 Reference Information Model (RIM) and HL7 Clinical Document Architecture (CDA): To communicate a single clinical document as a message (e.g. a discharge summary or a medical imaging records)

ISO 13606 Standard

- It has been designed specifically to achieve the semantic interoperability of the EHR
- Bases on a dual model approach
- It is prepared to work with formal clinical concepts in the form of archetypes

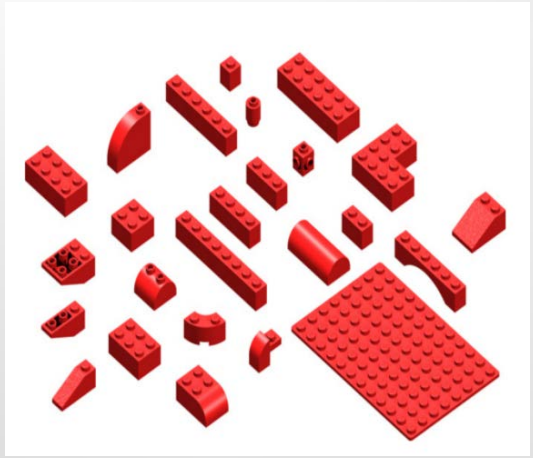
ISO 13606 Standard: Dual Model

- **Information**
  - Represented by a **Reference Model**
  - Facts that do not change
  - Example: "*Gina Smith (20y) has total cholesterol of 215 mg/dL*" is a statement about Gina Smith and does not apply to other people in general

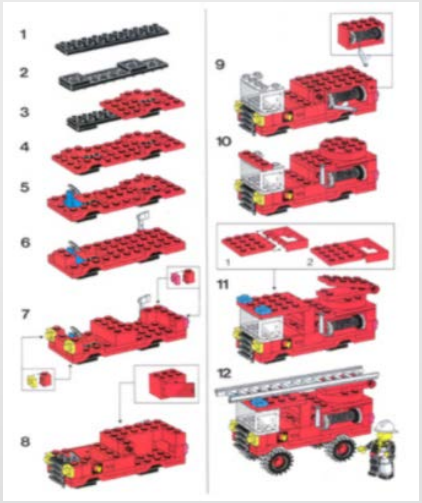
- **Knowledge**
  - Represented by **Archetype Model**
  - It can evolve over time
  - Example: *"Gina is hypercholesterolemic (because her total cholesterol level is more than 200 mg/dL) "*

ISO 13606 Standard: Dual Model

Lego™ Analogy

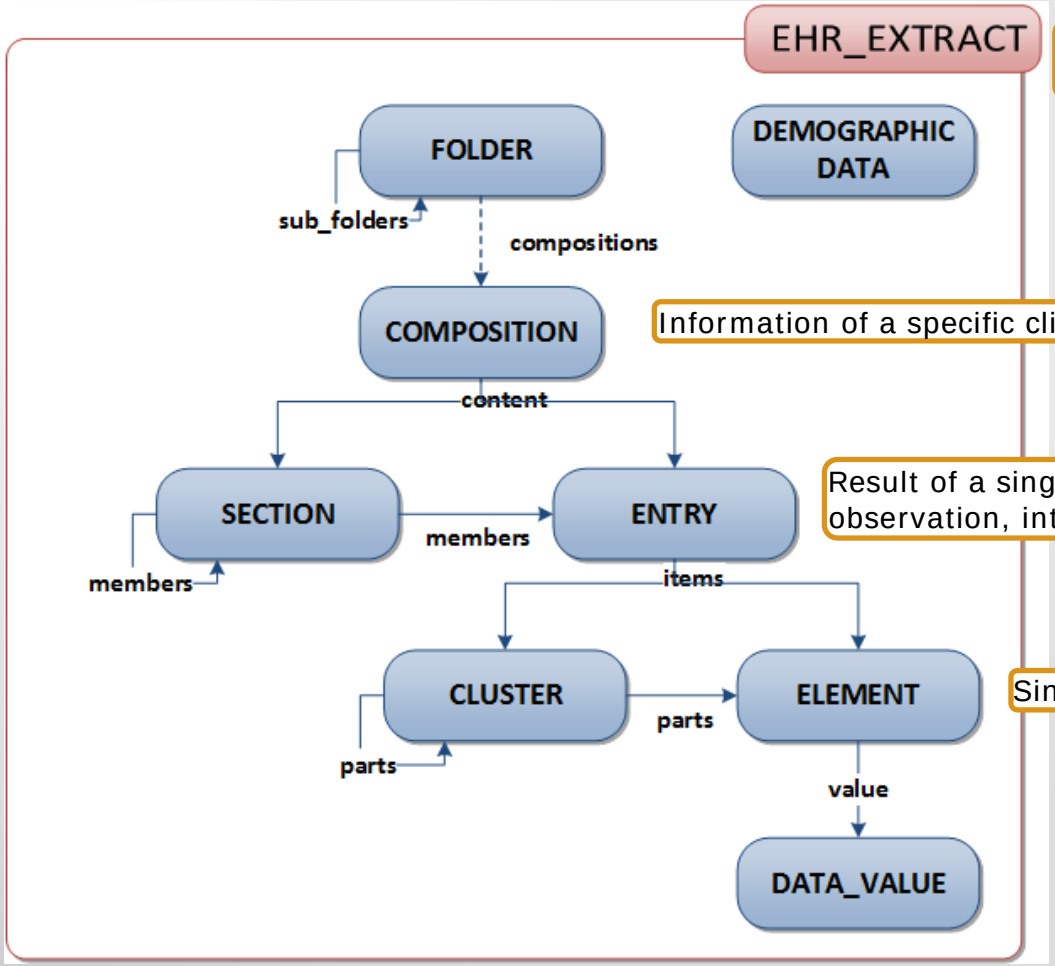


Reference Model

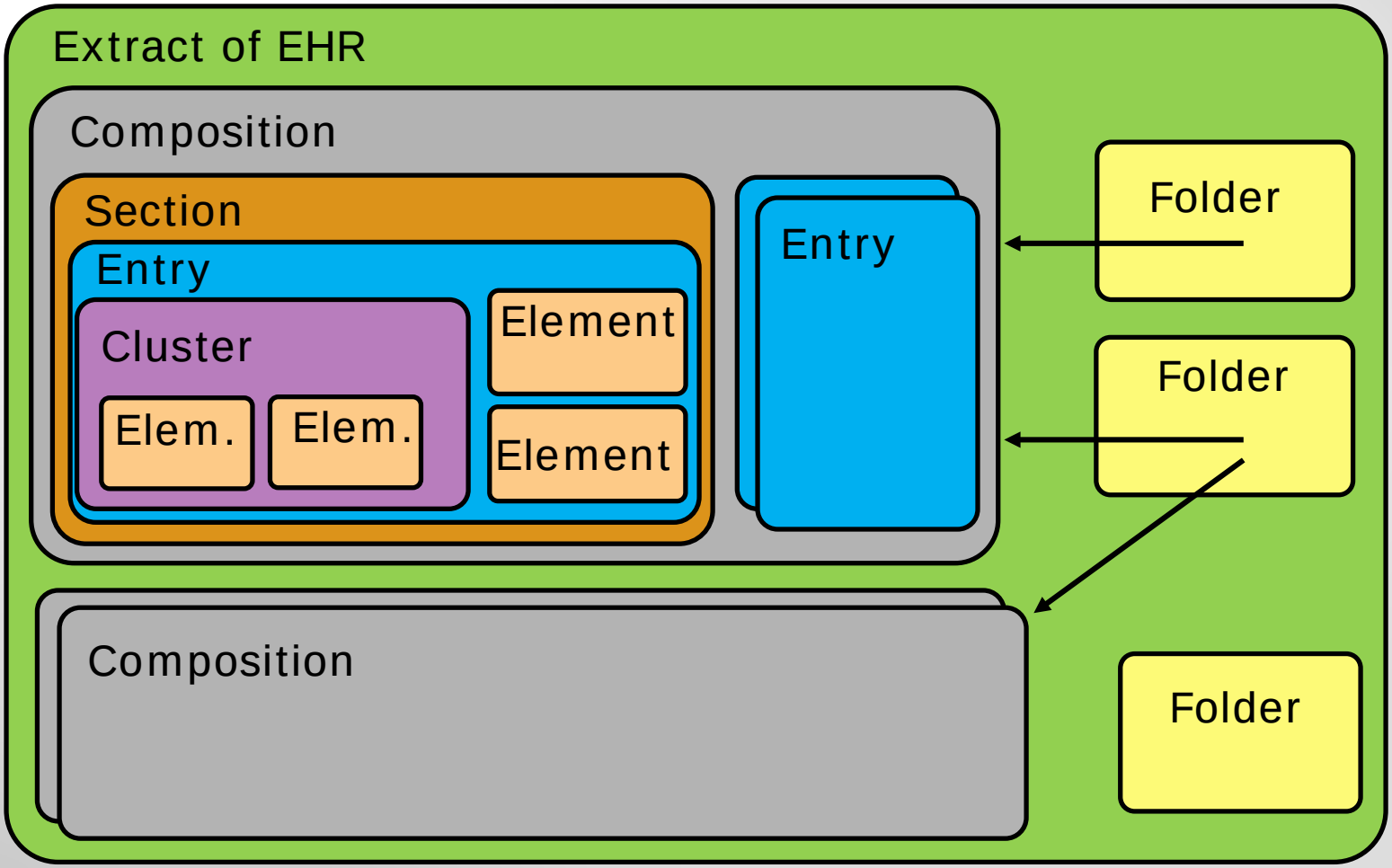


Archetypes Model

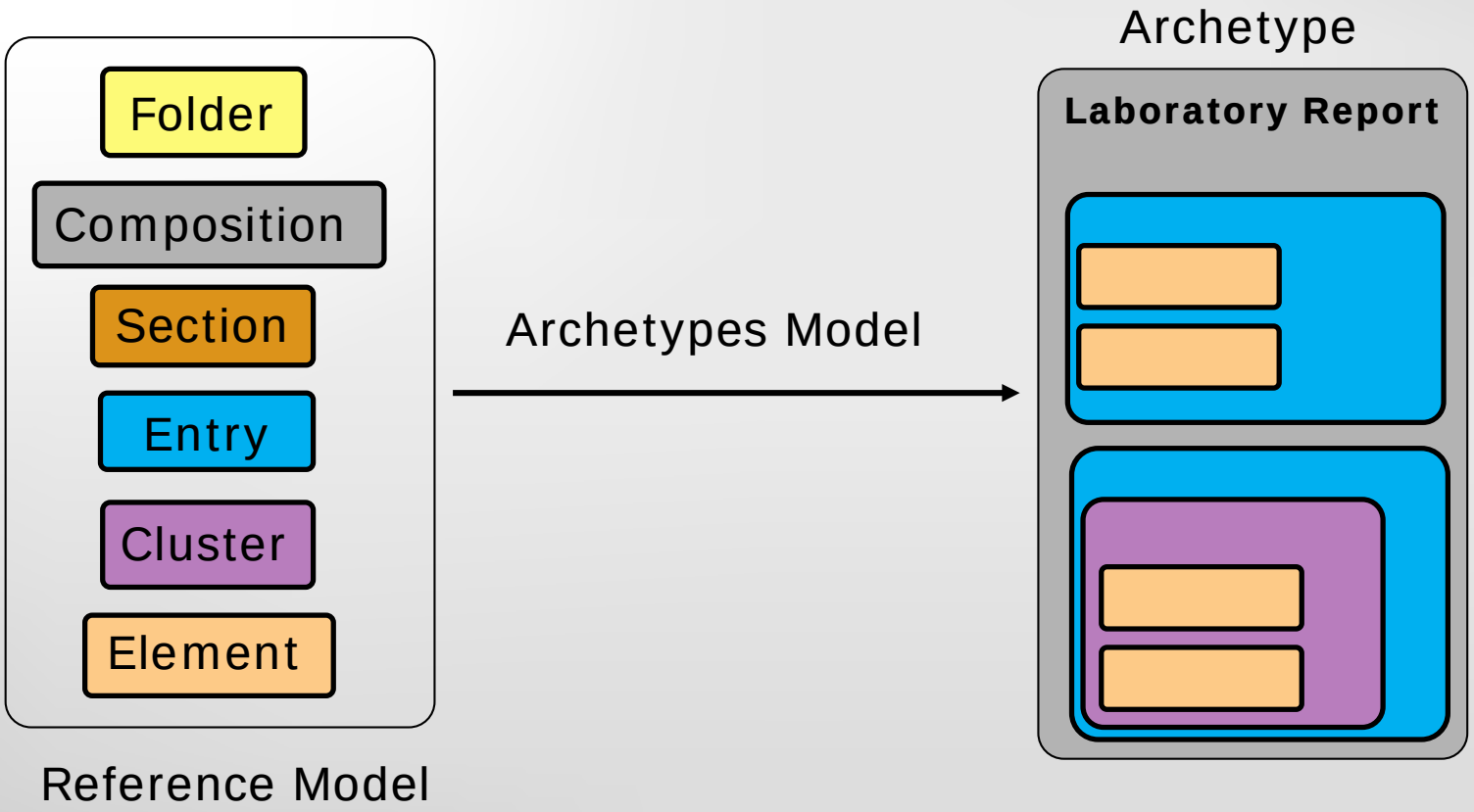
ISO 13606 Standard: Reference Model



ISO 13606 Standard: Reference Model

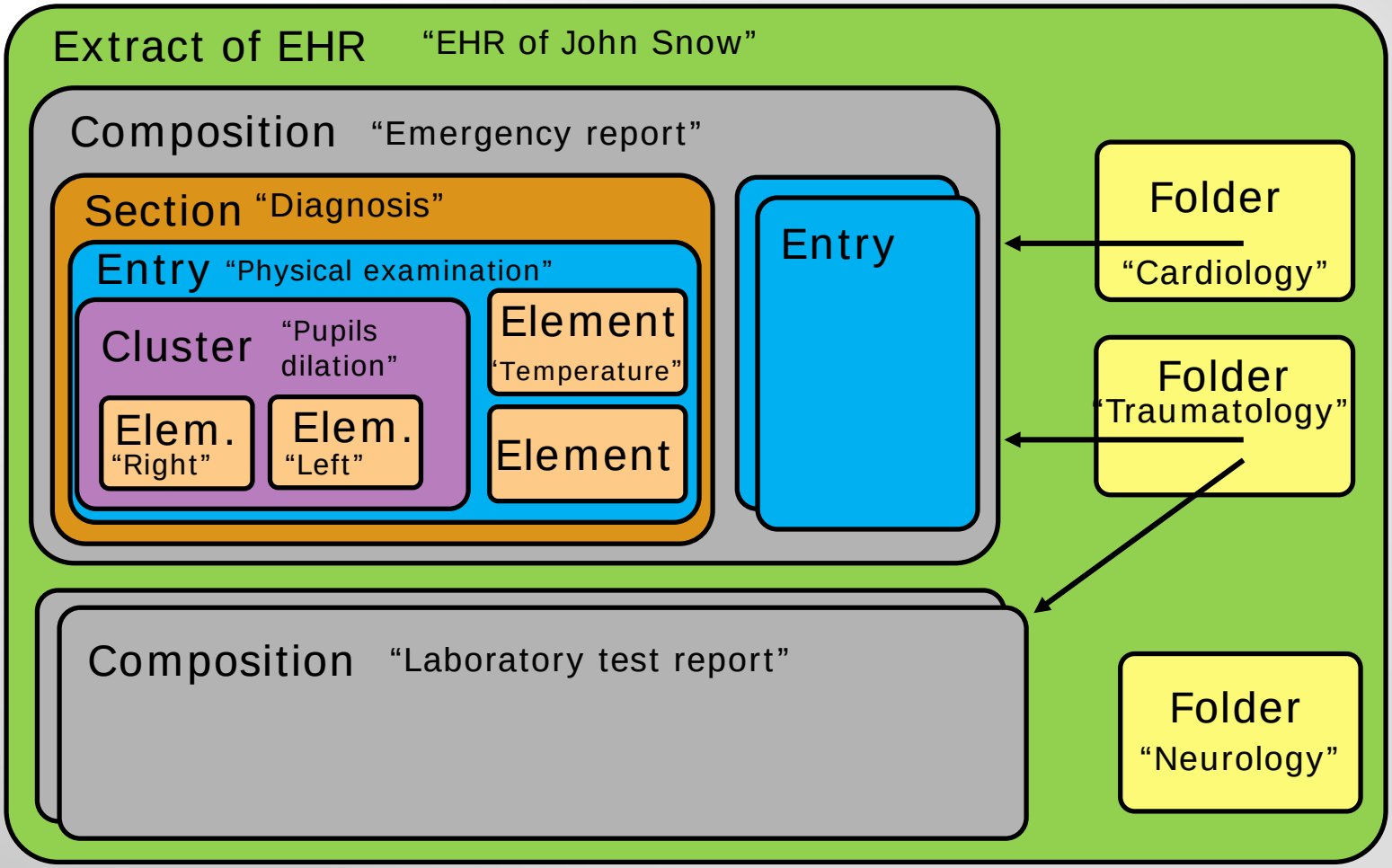


ISO 13606 Standard: Archetypes Model

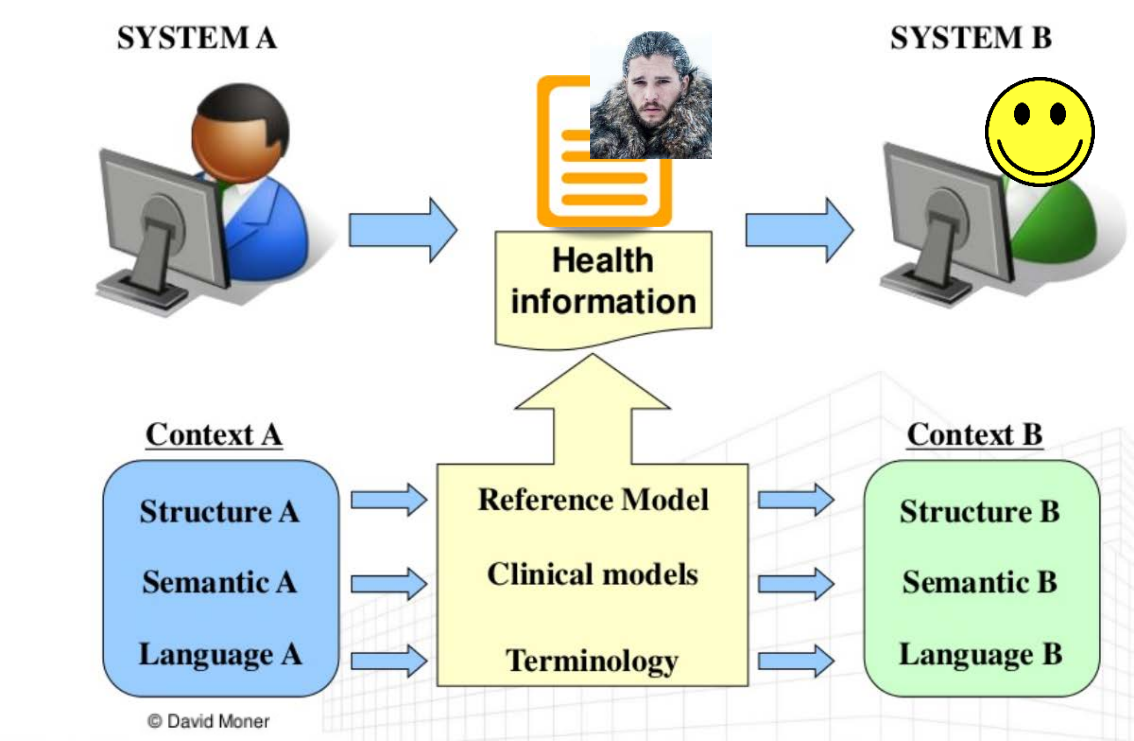


¨Archetype is a formal definition of a clinical concept based on entities of Reference Model¨

ISO 13606 Standard:
Reference Model and Archetypes Model

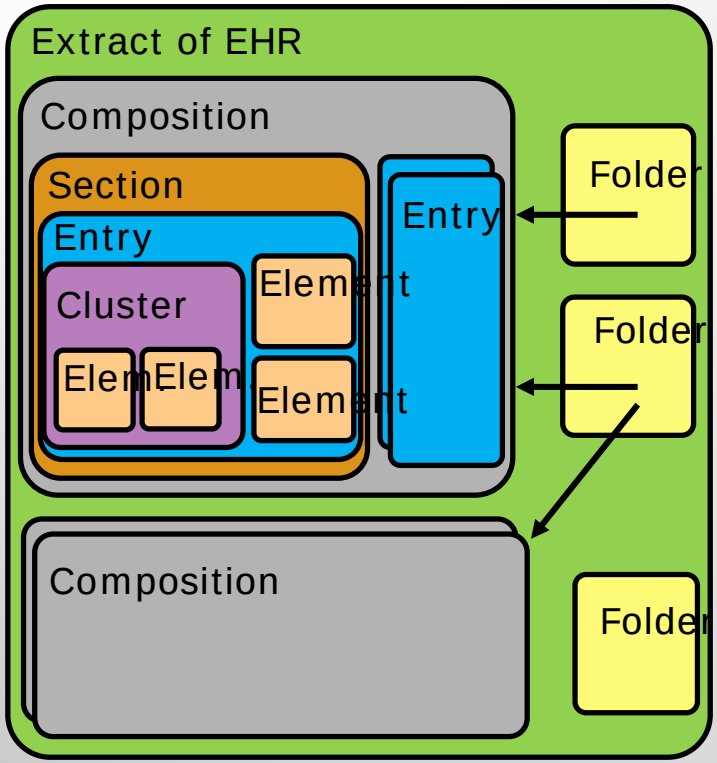


What we need to share EHR data of John Snow between two different EHR systems?



ISO 13606 Standard: Archetypes Model

Exercise: Design an archetype of “Blood analysis report” including this information:



Blood analysis report

Laboratory measurement

- Red blood Cell Count (RBC) (10^6/mm^3)
- White blood Cell Count (WBC) (10^9/L)
- WBC Differential:
  - Neutrophiles (10^9/L)
  - Lymphocytes (10^9/L)
  - Monocytes (10^9/L)
  - Eosinophiles (10^9/L)
  - Basophiles (10^9/L)

Blood pressure

- Blood pressure measurement (2 values: systolic and diastolic)
- Mean arterial measure
- Position (Lying, reclining, sitting, standing)
- Patient status (Relaxed, after exercise, before exercise)
- Place of measure (Arm, leg, finger, intra-arterial)

Comments

Give your opinion about EHR

EHR: the inflection point of medicine
Sunil Bhoyrul | TEDxLaJolla

1. What do you think about the argumentation lines of Sunil Bhoyrul? Is the EHR implementation the cause of loosing excellence, humanity and respect? Why?

2. How can you argue in opposite of his argumentation? Do you think that EHR can help to improve excellence, humanity and respect in healthcare? How?

3. What do you learn from his argumentation? How can we as researchers and engineers take his argumentation into account?

Assignment for next March 4th: EHR solutions Workshop

Assigned students:

- Hugo Helder
- Gudrun Thorsteinsdottir
- Leon de Reeder
- Andreas Sakapetis

Each assigned student:

1. **Select a paper** of aprox. 8 pages about a mobile App for health and send it to v.burriel@uu.nl **before Wednesday at 13.00.** During the afternoon all selected papers will be published on course's website.

2. **Prepare a presentation** of **7/8 minutes** about the paper and include some questions (at least 2) at the end of the presentation to challenge the audience and activate the discussion.

3. Join with the other assigned students and **prepare 1 or 2 group activities** to make during the last 30 minutes of the session. This activities should be related to the solutions presented.

Assignment for next March 4th: EHR solutions Workshop

Each no-assigned student:

1. **Read all the selected papers** and **prepare some questions or comments** (at least 2) per paper to discuss them after the presentation. Try to be critical and/or creative.

2. Send the questions/comments using this form **before Monday**
https://goo.gl/forms/K69vlahNqxzFe1ZG3