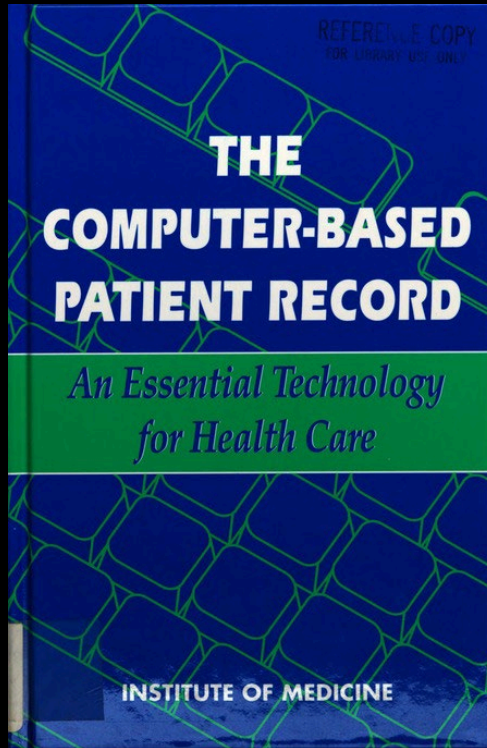# Goodbye Electronic Health Record?

EFMI STC 2022 Conference

Cardiff, Wales
September 8, 2022

W. Ed Hammond, PhD, FACMI, FHL7, FAIMBE, FIMIA, FIAHSI
Duke Center for Health Informatics
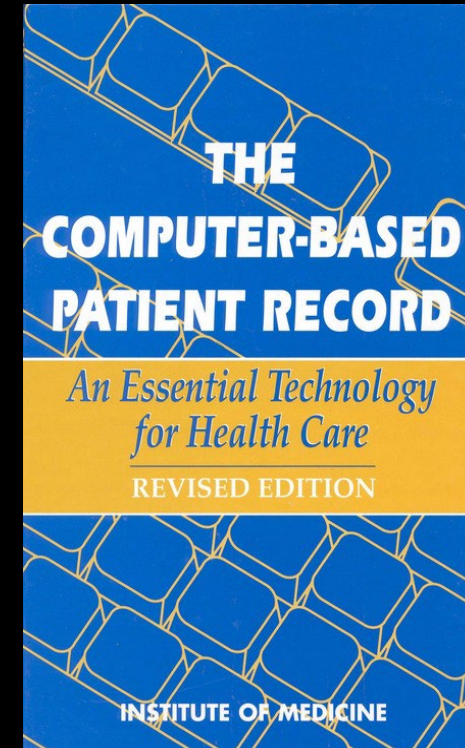Clinical & Translational Science Institute
Duke School of Medicine

THE COMPUTER-BASED PATIENT RECORD

Published by the Institute of Medicine – now the National Academies of Medicine

1991

1997

Requirements for Computer-based Patient Record

- Support patient care and improve quality
- Enhance productivity of health practitioners
- Reduce administrative costs
- Support clinical and health services research
- Accommodate future developments in health care technology, policy, management, and finance
- Insure patient data confidentiality

Today's EHR has not met these expectations!

Different Users Have Different Requirements

- Primary care –manage different aspects of the case
- Specialists – focus on specific diseases
- Chief resident – focus on teaching during rounds
- Pharmacy's view – focus on medications
- Dietitian view – support diet and nutrition
- Security department – identifies security risks
- Accounting department – focus on what should be charged
- Research view – access to data without violating patient privacy
- Policy makers – reporting views to prepare reports relating to privacy

EHR Was Doomed From The Start

- Systems were designed by computer engineers with little input from the medical community.

- Systems designed exclusively for inpatient systems.

- Systems were very expensive and only large hospitals could afford them.

- Systems focused on service functions not using data for improving patient care.

- Laboratory systems were developed separately with separate databases.

- Financial systems were developed separately with their own databases.

- Patient management systems largely duplicated the patient chart.

- Architectural framework has remained unchanged. Systems have evolved from the beginning, not restarted.

Proposal for change

- Replace the current EHR model
- Adopt a single common set of data elements
  - Single data element for each concept with a unique definition
  - Rich set of attributes for each data element
  - Attributes include computable knowledge for data elements
  - Build structures based on atomic data elements
- Functional and cognizant-based application program interfaces (API)

Different approaches to data storage

- All data about a patient is stored in a single data cell.
  - Clinical, genomic, behavior, social, economic, environment, family history
  - May contain multiple databases, but data is managed by knowing precisely where data is located.
  - Instantly knowing if data element exists.
- Data is stored as data – not as a function of use.
- All functionality for using the data is external to the data cell.
- Interaction with the data is through Representational State Transfer (REST) – Create, Read, Update, Delete

Making data work

- There are so many common data models, they are uncommon.
- Mapping between common data models is wasted energy. Mapping always results in a loss of information.
- Data sharing and data aggregation are becoming mandatory in health care.
- Goal is a single, common set of data elements with a rich set of attributes used nationally and, perhaps, internationally.
- Attributes provide an opportunity to add computable knowledge and controls to data. Examples include ontology, linkages, decision support links, quality assurance, risk factors, phenotypes, and management data.

Doing the impossible

- HL7/FHIR and OHDSI/OMOP have entered an agreement to create a common set of data elements and a common data model.

- PCORI has now joined the group working on a common set of data elements.

- ONC is supportive of the idea, and we are looking to integrate USCDI.

- Other groups we plan to recruit include CDISC, NLM VSEC, CMS, CDC, FDA, CMS, LOINC, SNOMED, CodeX, i2b2/ACT, caDSR, others

- We are proposing using the Clinical Societies as the doorway to creating data elements and being the stewards of data elements.
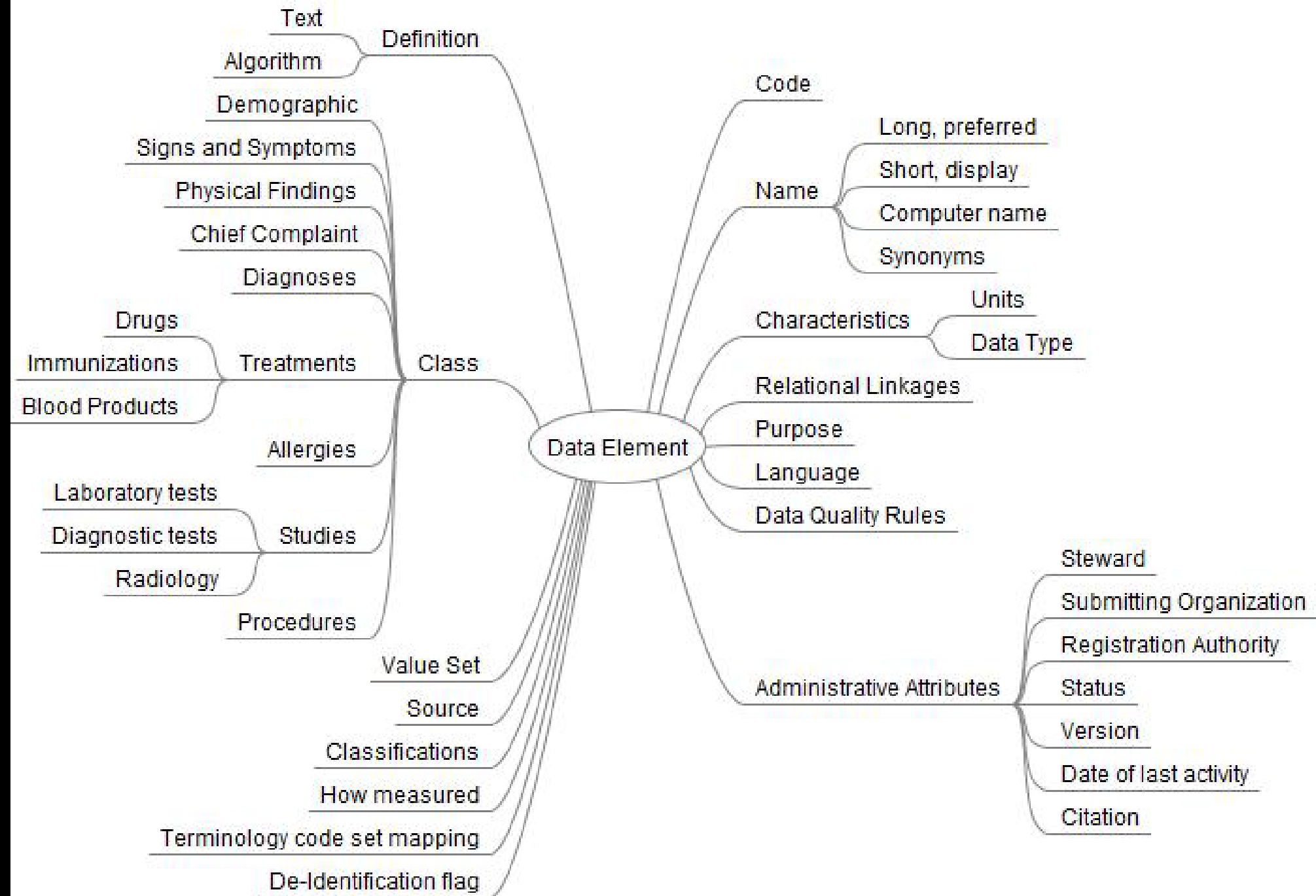
Data elements value enhanced

- Create structured sets of data elements into larger groupings
  - Simple cases such as blood pressure, heart murmurs, BMI
  - More complex sets such as an echocardiogram, cardiopulmonary exercise testing
  - Structures to capture complex phenomena yet are easy to work with
  - Functional sets such as well baby work-up, pediatric growth, kidney function, maternal health
  - Phenotypes – diagnostic, treatment, monitoring
  - Tracking Covid patients (and others) across time and space
  - Registries
  - Computable knowledge built into the data element
  - Any defined purpose for a standardized grouping of data elements

Use of data

- Use functionality is performed independently by functional apps.
  - Permits keeping up with new technology and new requirements
  - Allows specialization of data presentation and use
  - Enables competitive market
- Supports query-based interactions: pull over push
- Permits cognitive use of the data through Application Program Interfaces (API)
- HL7 International ® SMART on FHIR ® provides a standard for developing these APIs.

SMART ®

- Enables vendors to create apps that seamlessly and securely run across healthcare systems

- Defines a health data layer that builds on FHIR and resource definitions

- Applies set of profiles used to express meds, problems, labs and other clinical data

- Patients, clinicians, others can draw on library of apps to improve clinical care , research, and public health

Pediatric growth chart – innovative parent's view

- Custom view optimized for communication with parents and child

- Visually project height in terms of parent's height

- Print copy for parents, or email via portal
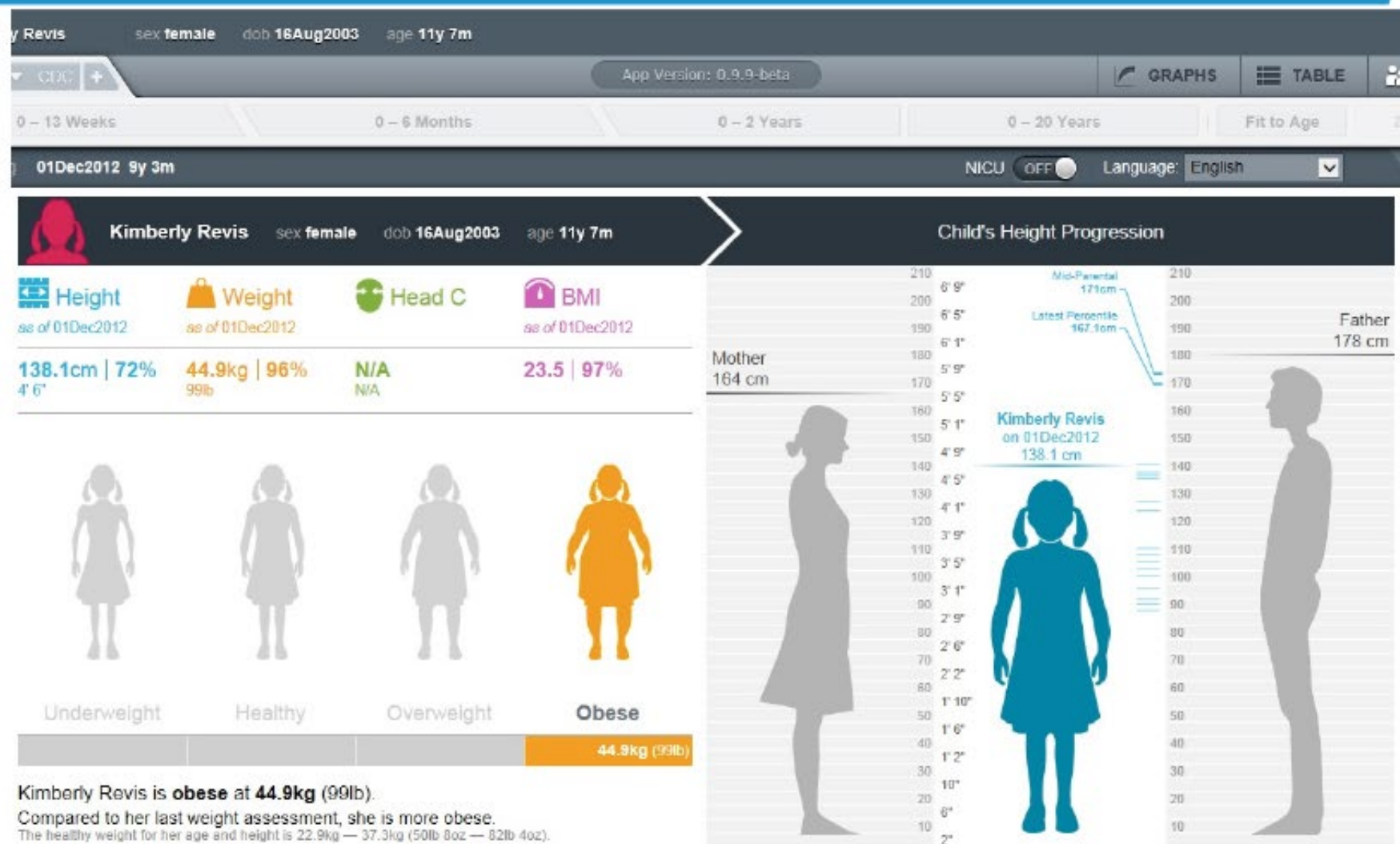
Examples of Cognitive APIs

- Functional and productive problem list
  - Problem list can drive activities and clinical behavior
- Support or do documentation
- Link different types of data in innovative ways
- Use phenotypes to drive effective use of knowledge along with patient data to reduce uncertainty and aid decision-making
- Change passive data storage to innovative partnerships in patient care

What does this mean to the health system?

- Access to more data of higher quality and consistency establishing trust.

- Receiving data from clinical trials directly and automated.

- Increasing use of AI with decisions and contact directly involving patients new regulations and responsibilities.

- New tools to more quickly make decisions?

- Constant vigilance to make sure regulations enhance and not limit of delay advances in health and health care.

- You are the experts. What do you think?

DISCUSSION