

Health Informatics

Levels of integration

How to define “integrated healthcare”?

<Revision>

Shareable EHR with HISs

- Sharing of HISs information must be at multiple levels:
 - **At institution level**
 - A healthcare institution must be able to share patients' information generated by *its HISs*
 - **At national level**
 - A healthcare institution must be able to share patients' information generated by other *national healthcare institutions* (i.e., Hospitals, Medical Lab centers, Doctors' clinics)
 - **At international level**
 - A healthcare institution must be able to share patients' information generated by other *international healthcare institutions*

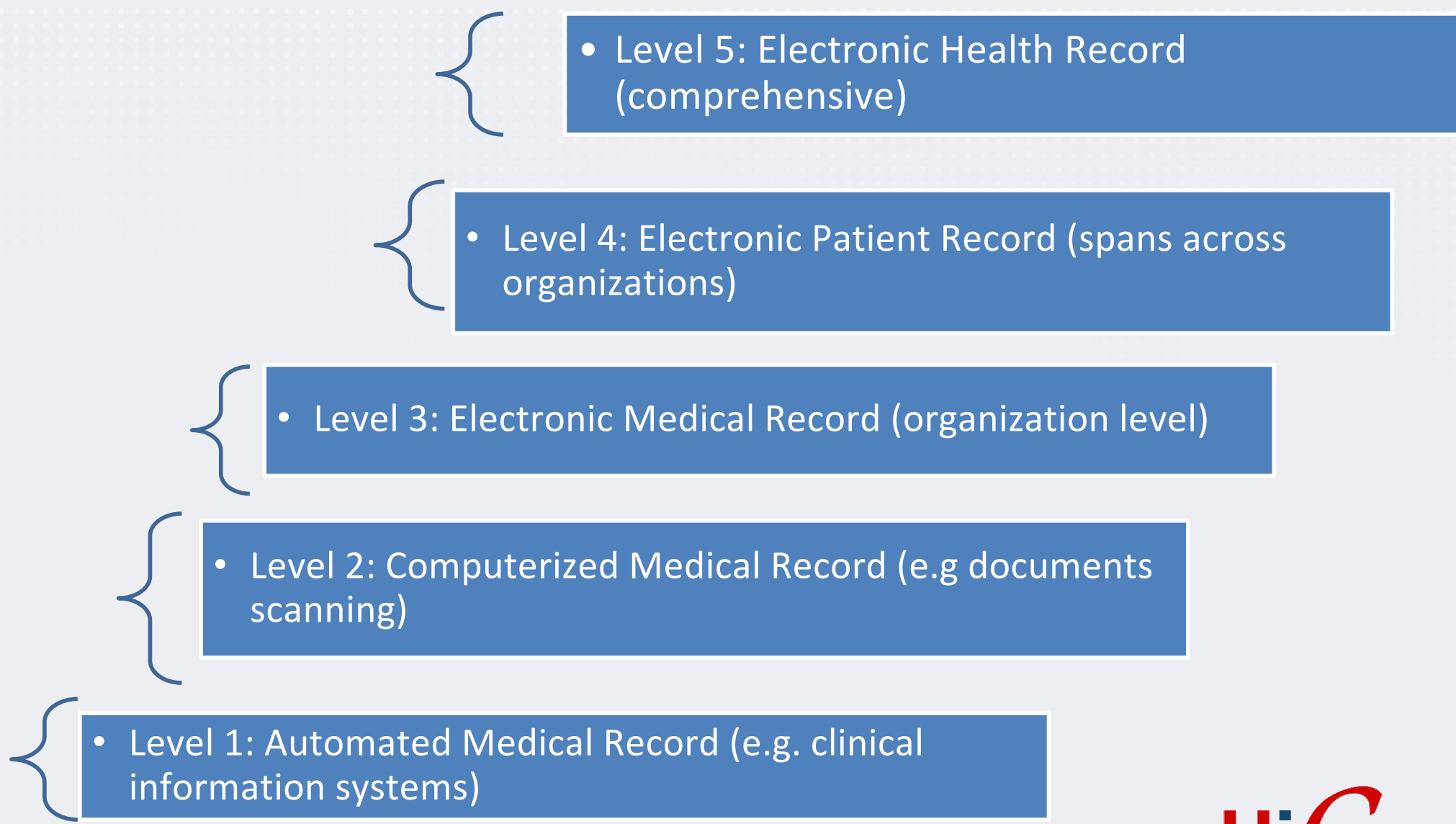
Shareable EHR with HISs

- Not all healthcare institutions (i.e., doctors' clinics, healthcare and radiology centres, medical labs, hospitals, etc.) adopt shareable EHR
- The “meaningful use” of EHR requires healthcare institutions to share information that is generated and managed by HISs

Models of Integrated Healthcare (or EHR Adoption)

- **Model-1: Waegeman's Model of EHR development**
 - Defined first in 1996
 - Redefined in 2002
- **Model-2: The Healthcare Information and Management Systems Society (HiMSS) Model of EHR Adoption**

Five Levels of Electronic Health Records: Waegeman's Levels 1996



- Level 5: Electronic Health Record (comprehensive)

- Level 4: Electronic Patient Record (spans across organizations)

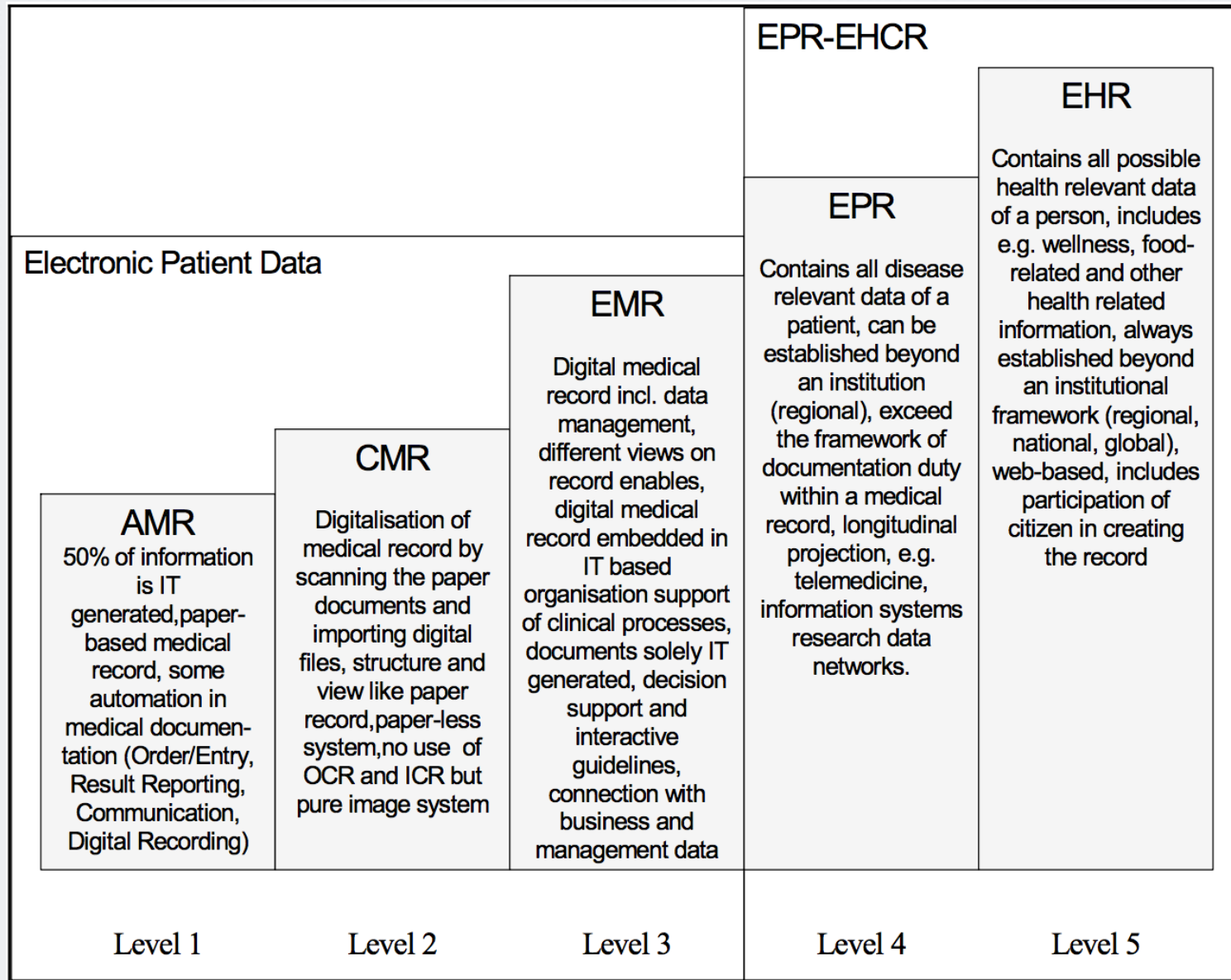
- Level 3: Electronic Medical Record (organization level)

- Level 2: Computerized Medical Record (e.g. documents scanning)

- Level 1: Automated Medical Record (e.g. clinical information systems)

(Waegemann, 1996)

Five Levels of EHRs: Waegeman's Levels refined in 2002



Source: adapted from Waegemann (2002) and Blobel B (2003)³²

Shareable EHR with HISs

- The Healthcare Information and Management Systems Society (HiMSS) identify an **EHR adoption model**
 - It consists of eight level stages (0 - 7) that measures the adoption and utilisation of shared EHR Functions
 - It aims to promote and support healthcare institutions to adopt EHR and integrate it with their HISs

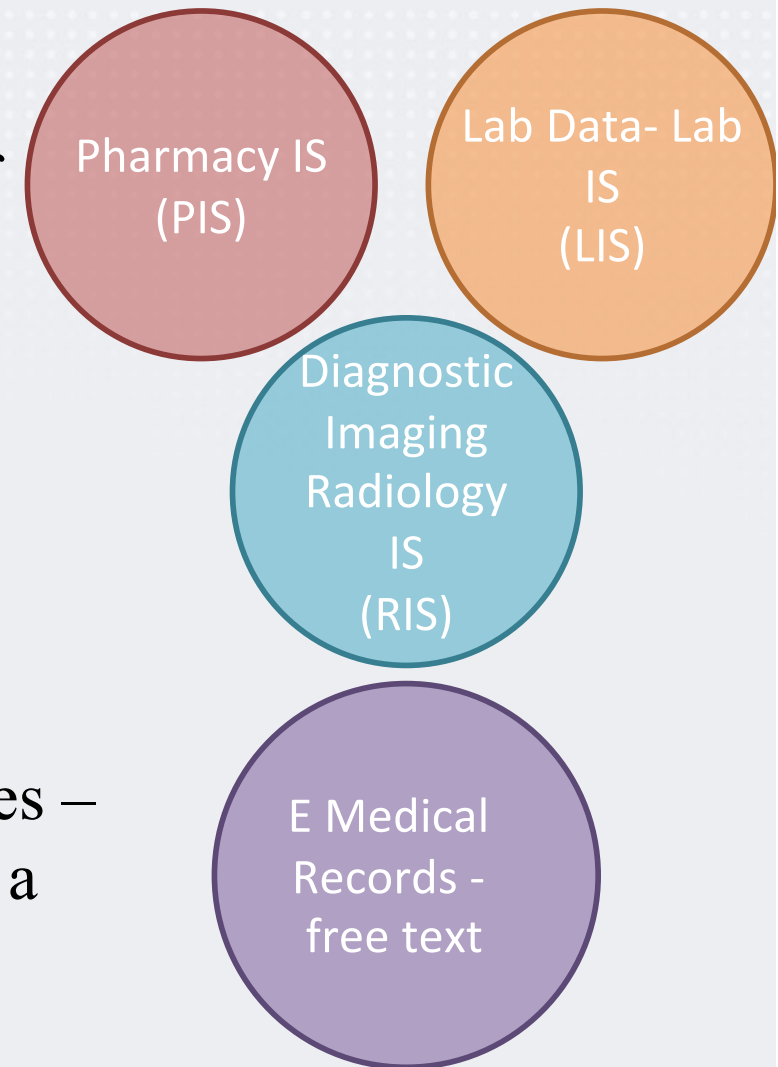
Shareable EHR Adoption Model...

- **Level (0)**
 - The organization **has not installed** all of the three key ancillary clinical information systems
 - Laboratory IS
 - Pharmacy IS
 - Radiology IS
 - Paper-based records are the only means of storing and accessing clinical information

Shareable EHR Adoption Model...

- **Level (1)**

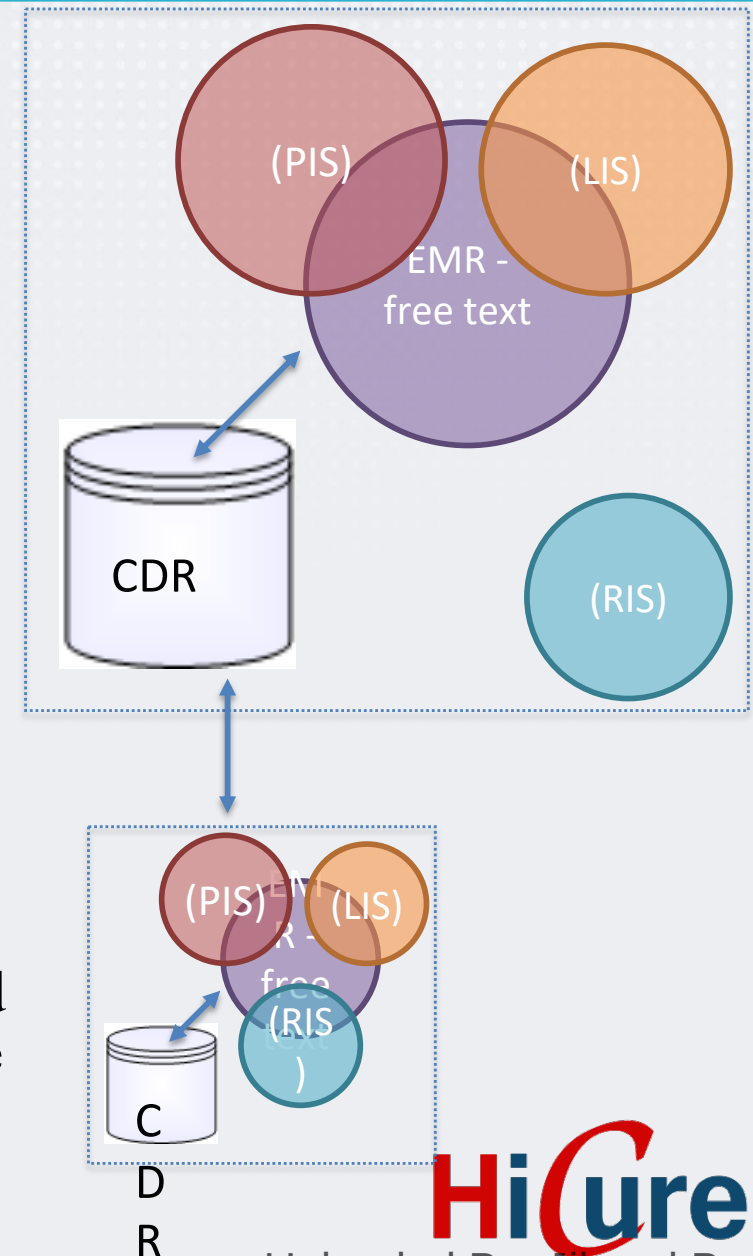
- The organization **has installed** all of the three key ancillary clinical information systems
 - Laboratory IS
 - Pharmacy IS
 - Radiology IS
- Electronic storage of healthcare notes – normally as **free text** - are stored in a patient record



Shareable EHR Adoption Model...

- **Level (2)**

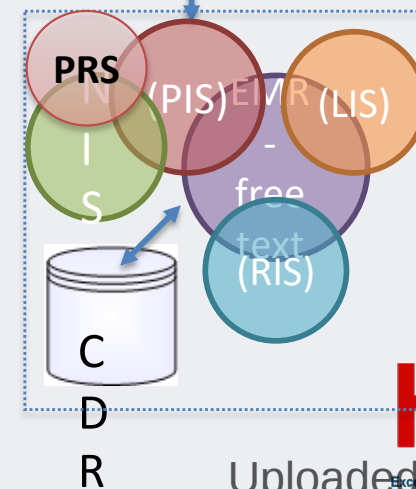
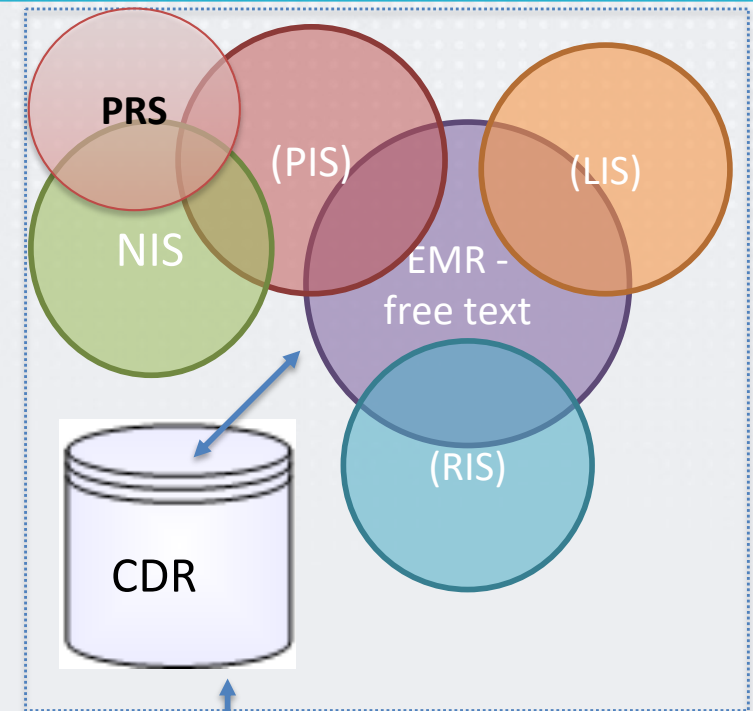
- Major ancillary clinical systems feed data to a **clinical data repository (CDR)**
 - The CDR provides physician access for reviewing all orders and results.
 - The CDR contains a controlled medical vocabulary, and the clinical decision support/rules engine (CDS) for rudimentary conflict checking.
 - Information from document imaging systems may be linked to the CDR at this stage.
- The hospital may have **health information exchange (HIE)** capability at this stage and can share (part of) information it has in the CDR with other healthcare providers.



Shareable EHR Adoption Model...

- **Level (3)**

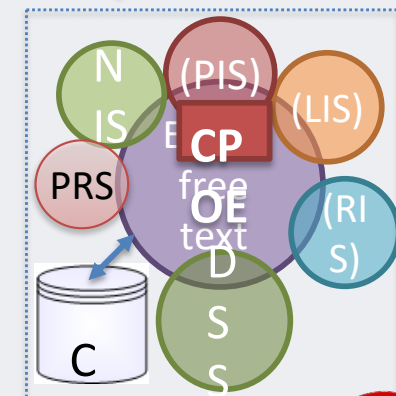
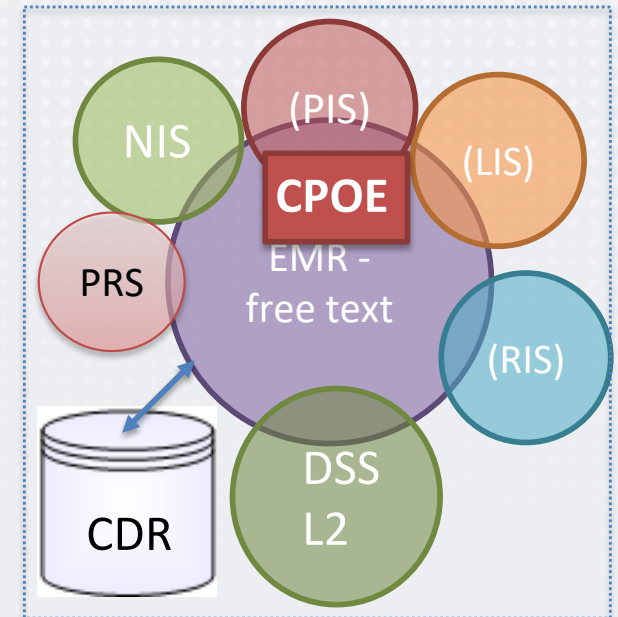
- **Nursing/clinical documentation** (e.g. vital signs, flow sheets, nursing notes, etc.) is required, implemented and integrated with the CDR
 - Care plan charting is scored with extra points
- The electronic Patient Registration System (**PRS**) or Patient Master Index system is implemented.
- Medical image access from Radiology information system (**RIS**) is available for access by physicians **outside** the Radiology department via the organisation's intranet.



Shareable EHR Adoption Model...

- **Level (4)**

- Computerised Practitioner Order Entry (**CPOE**) for use by any clinician licensed to create orders is added to the nursing, laboratory, radiology, and CDR environment
- The *level two of clinical decision support (DSS)* capabilities related to **evidence-based medicine protocols**.
- This stage is considered achieved if one inpatient service area has implemented CPOE with physicians entering orders and completed the previous levels (i.e., 1, 2, and 3)



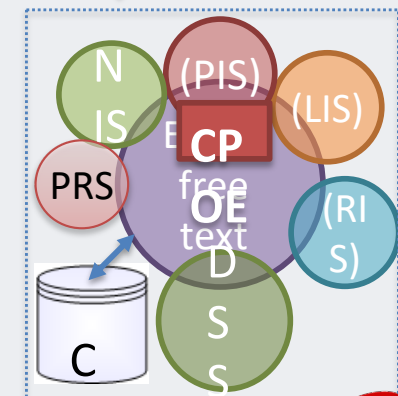
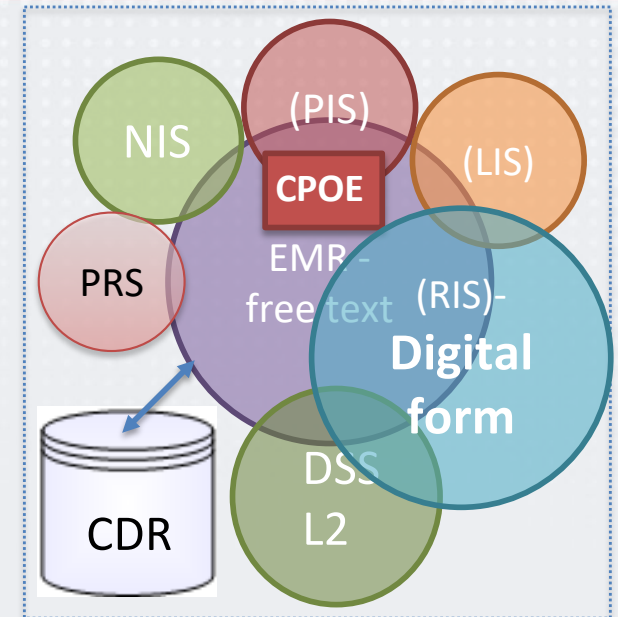
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HiCure

Shareable EHR Adoption Model...

- **Level (5)**

- A full complement of **RIS** systems provides medical images to physicians via an intranet and communicates all film based images to different departments
- Cardiology RIS and document imaging are scored with extra points.



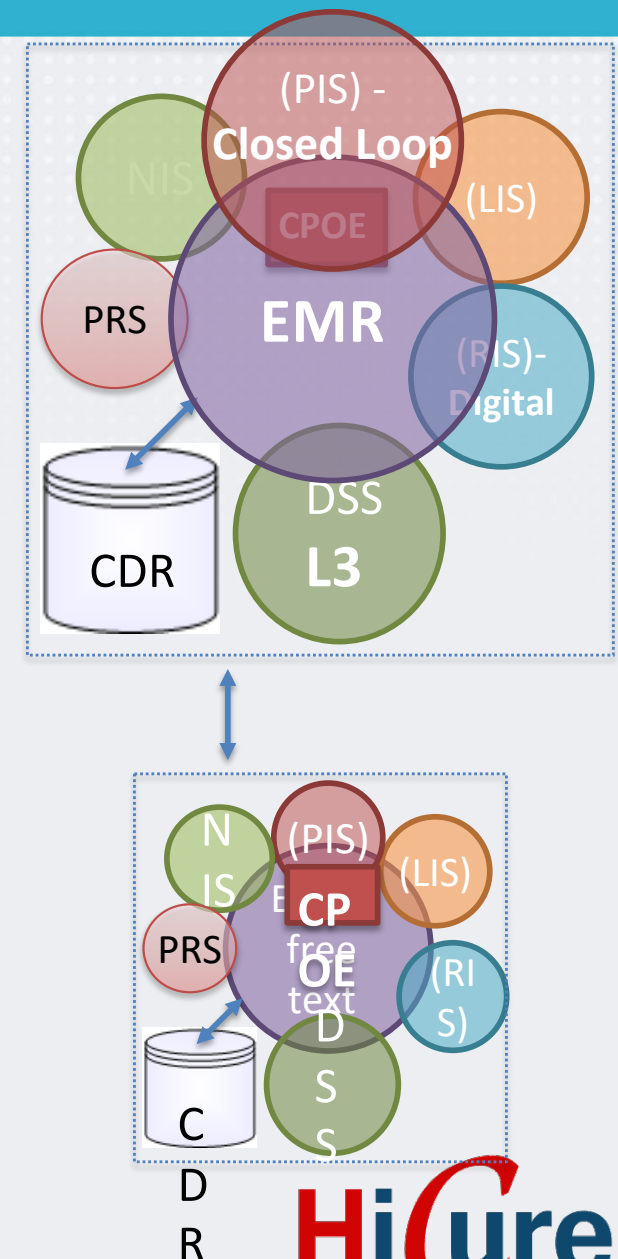
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Shareable EHR Adoption Model...

- **Level (6)**

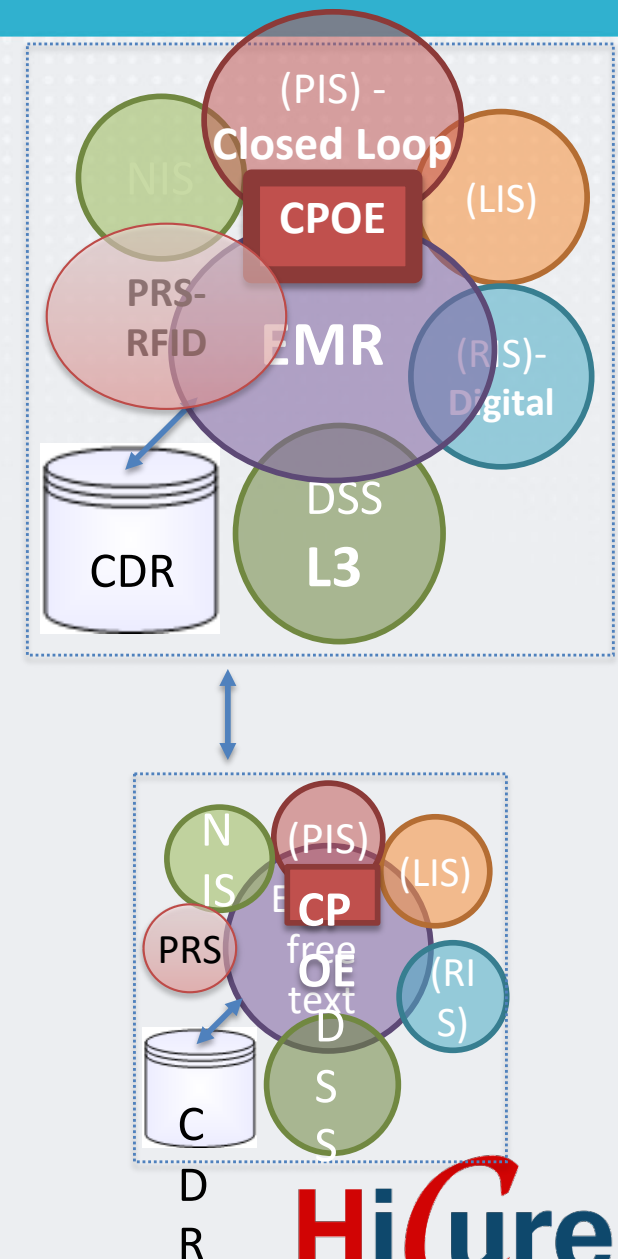
- Full physician documentation with structured templates and discrete data is implemented for: *progress notes, consult notes, discharge summaries or problem list & diagnosis list maintenance.*
- **Level three of *clinical decision support*** provides guidance for *all clinician activities* related to protocols and outcomes in the form of variance & compliance alerts
- The closed loop of medication administration with bar-coded unit dose medications environment is fully implemented



Shareable EHR Adoption Model...

- **Level (6) – cont.**

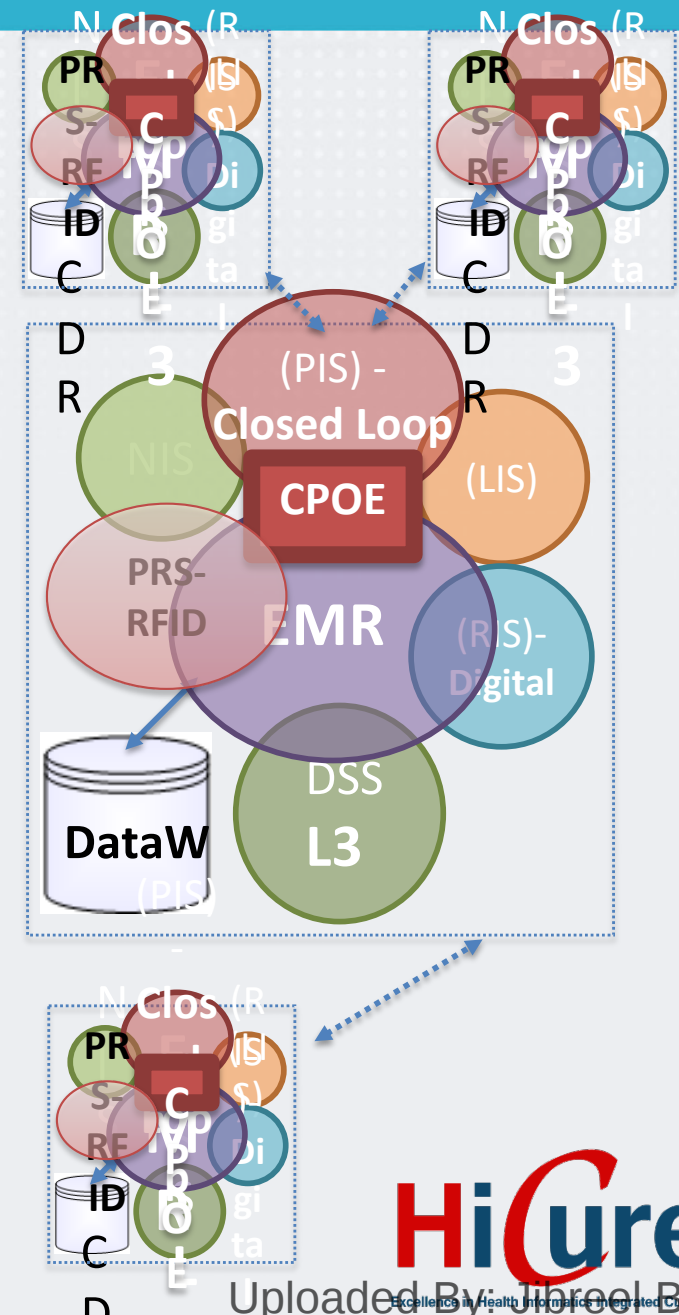
- The PRS and bar-coding or other auto identification technology - such as radio frequency identification (RFID) - are implemented and integrated with CPOE and pharmacy to maximise point of care patient safety processes for medication administration.
- The “*five rights*” of medication administration are verified at the bedside with scanning of the bar-code on the unit does medication and the patient ID.



Shareable EHR Adoption Model. (PIS)

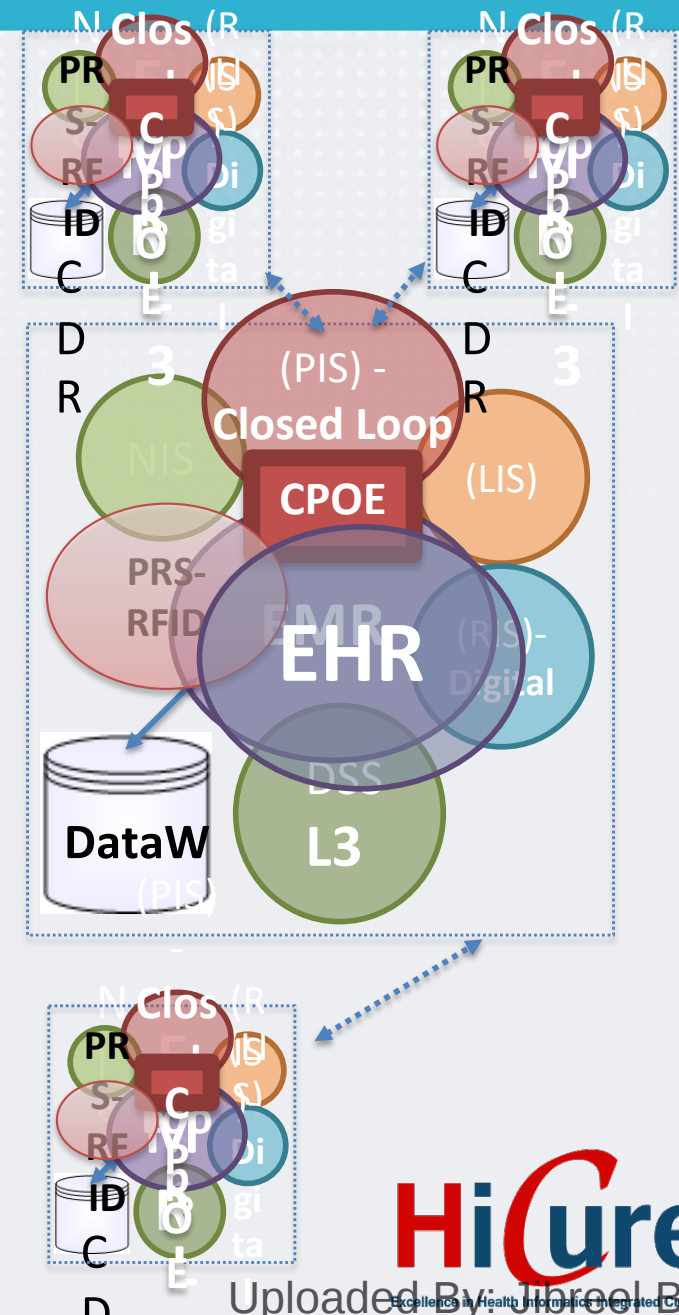
- **Level (7)**

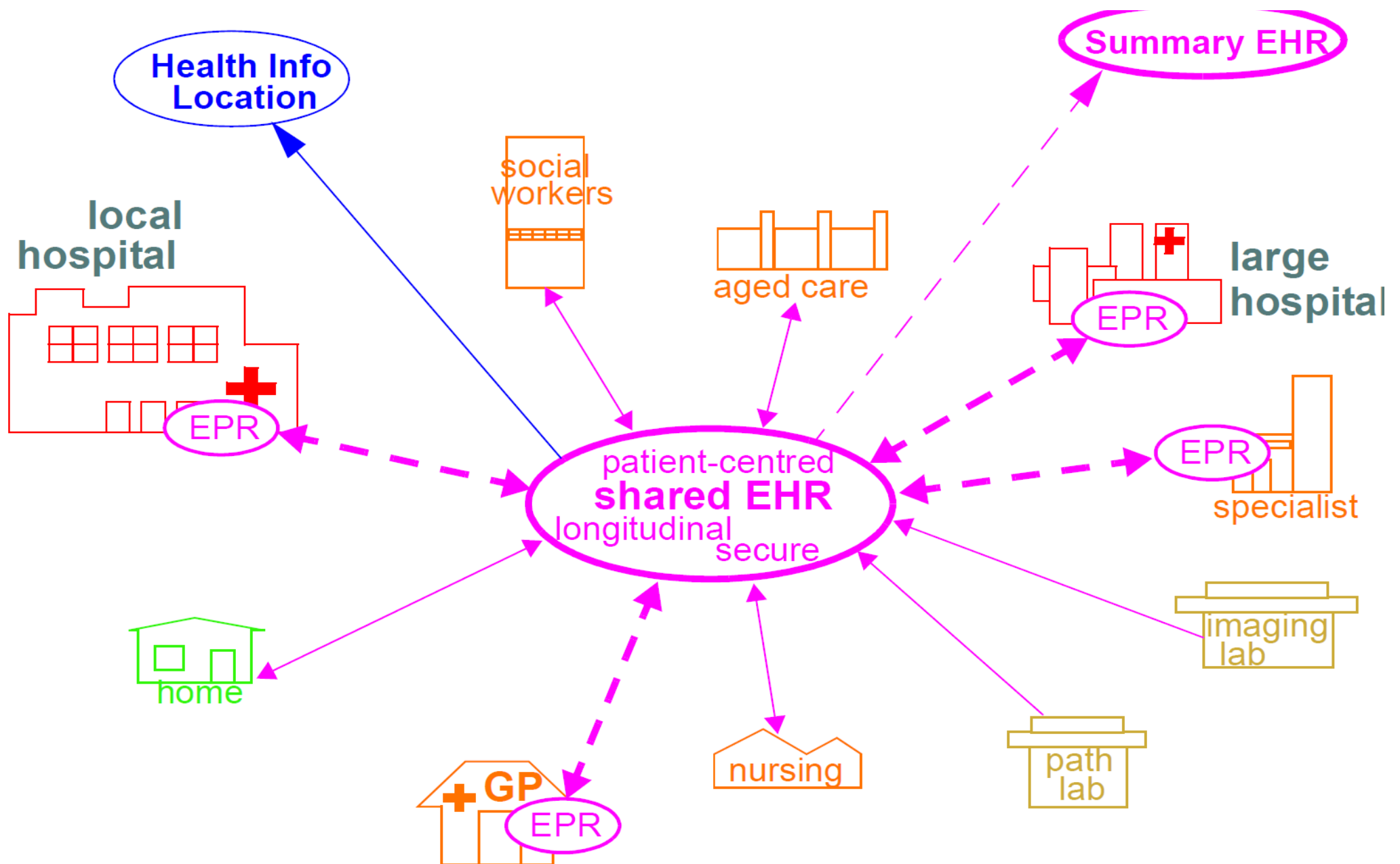
- The hospital no longer uses paper-based patient record to deliver and manage patient care
- Also, it has a mixture of discrete data, document images, and medical images within its EMR environment.
- Data warehousing is being used to **analyze** patterns of clinical data to improve quality of care, patient safety, and care delivery efficiency.
- Clinical information can be readily **shared** with all entities that are authorised to treat the patient, or a health information exchange (i.e., other non-associated hospitals, ambulatory clinics, employers, payers and patients in a data sharing environment)



Shareable EHR Adoption Model. (PIS)

- **Level (7) – cont.**
 - The hospital demonstrates **summary data continuity (full integrated healthcare)** for all hospital services (e.g., inpatient, outpatient, ED, and with any owned or managed ambulatory clinics).
 - Blood products and human milk are included in the closed-loop medication administration process.





Shared EHR

<http://www.openehr.org> – 05/02/2017