Health Informatics

Levels of integration

How to define “integrated healthcare”?

<Revision>

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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 sharable 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)

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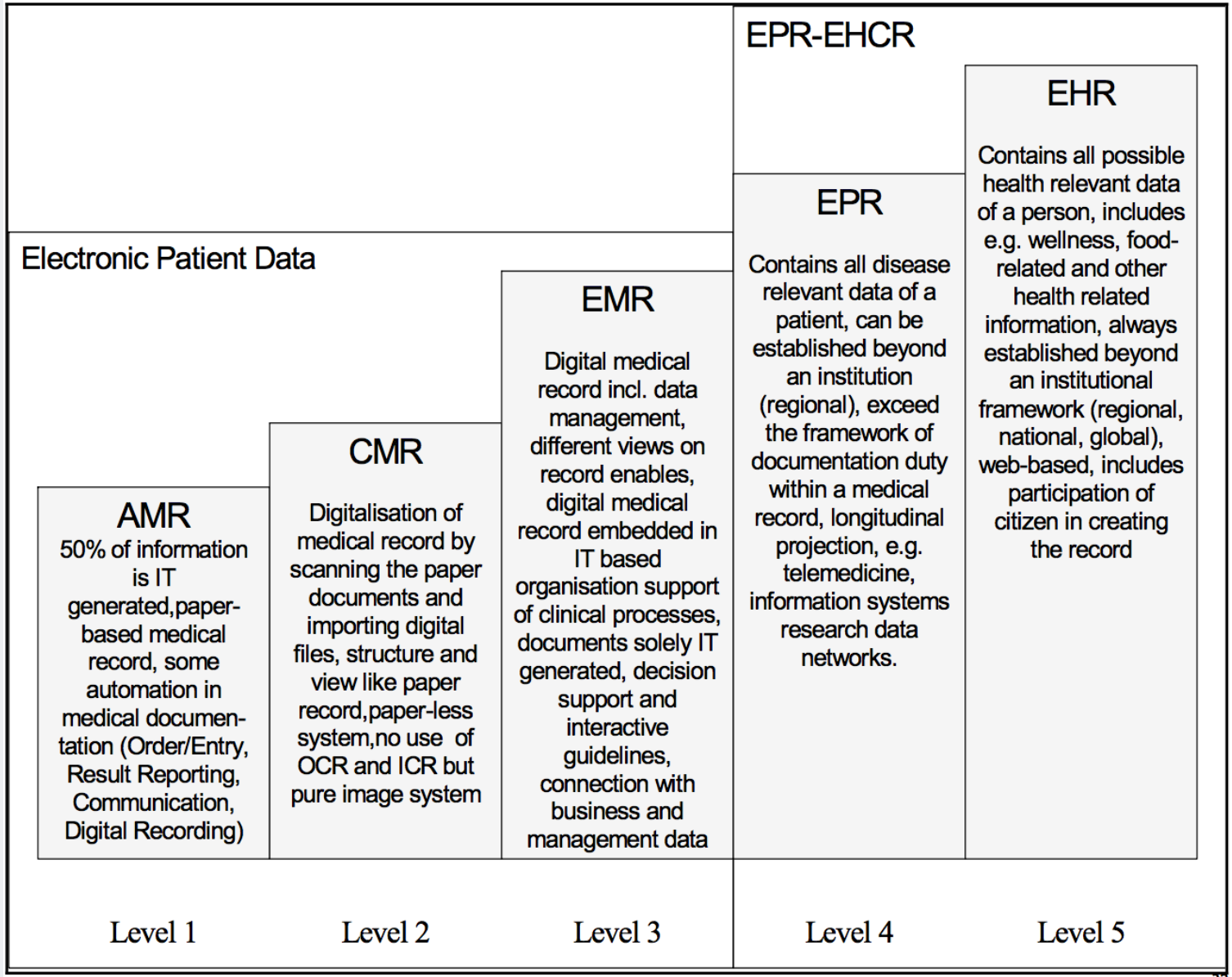
Five Levels of EHRs: Waegeman's Levels refined in 2002



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

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Shareable EHR with HISs

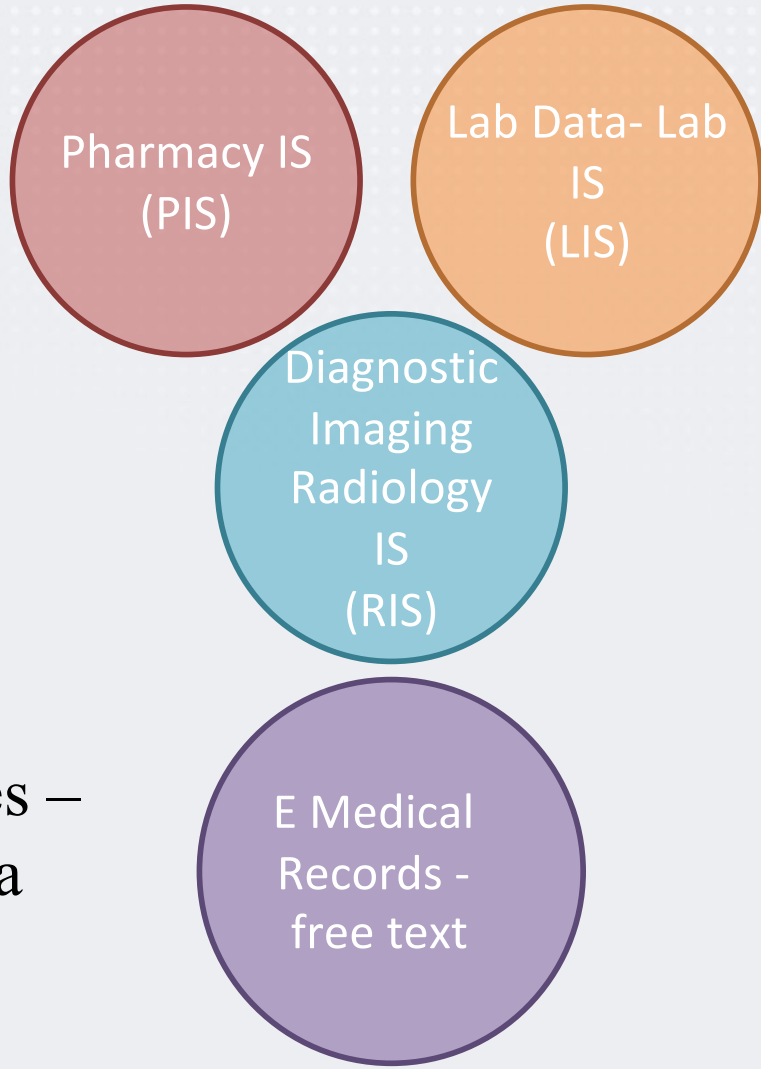
- The Healthcare Information and Management Systems Society (HiMSS) identify an **EHR adoption model**
  - It consists of eight level stages (0 - 7) that measures the adoption and utilisation of shared EHR Functions
  - It aims to promote and support healthcare institutions to adopt EHR and integrate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



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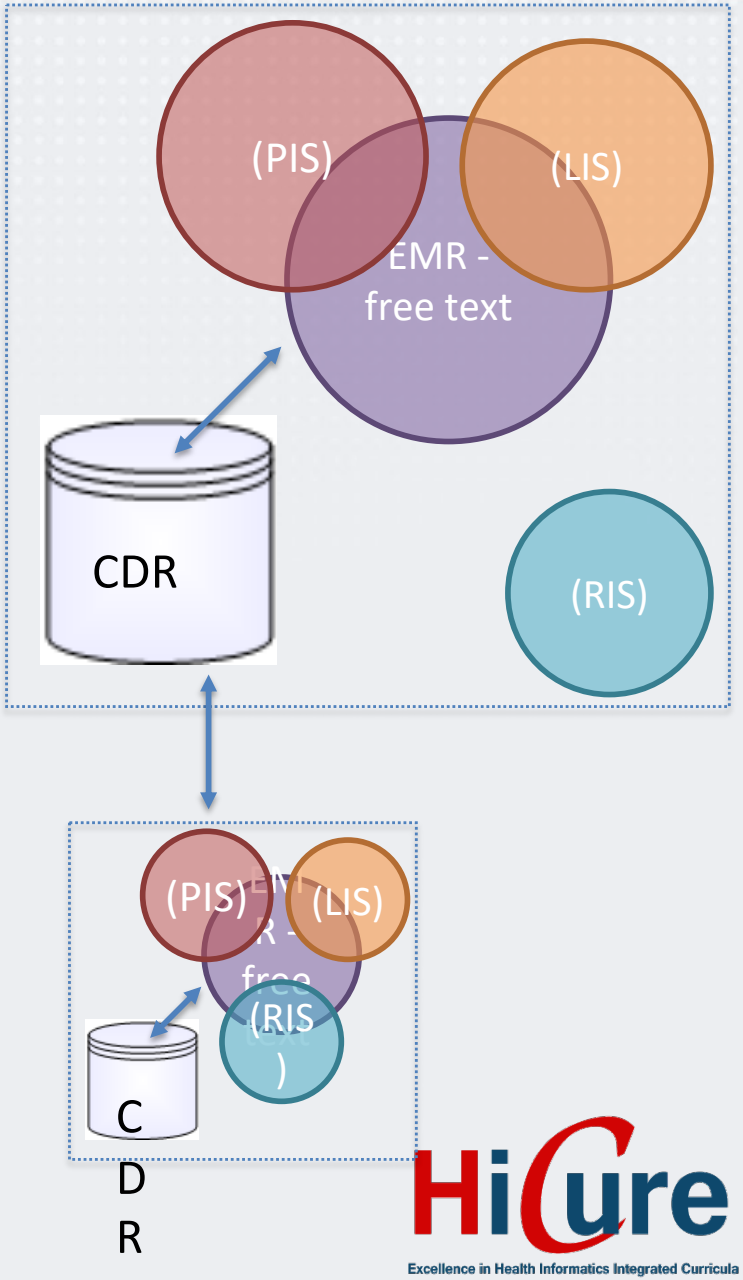
Shareable EHR Adoption Model…

- **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.



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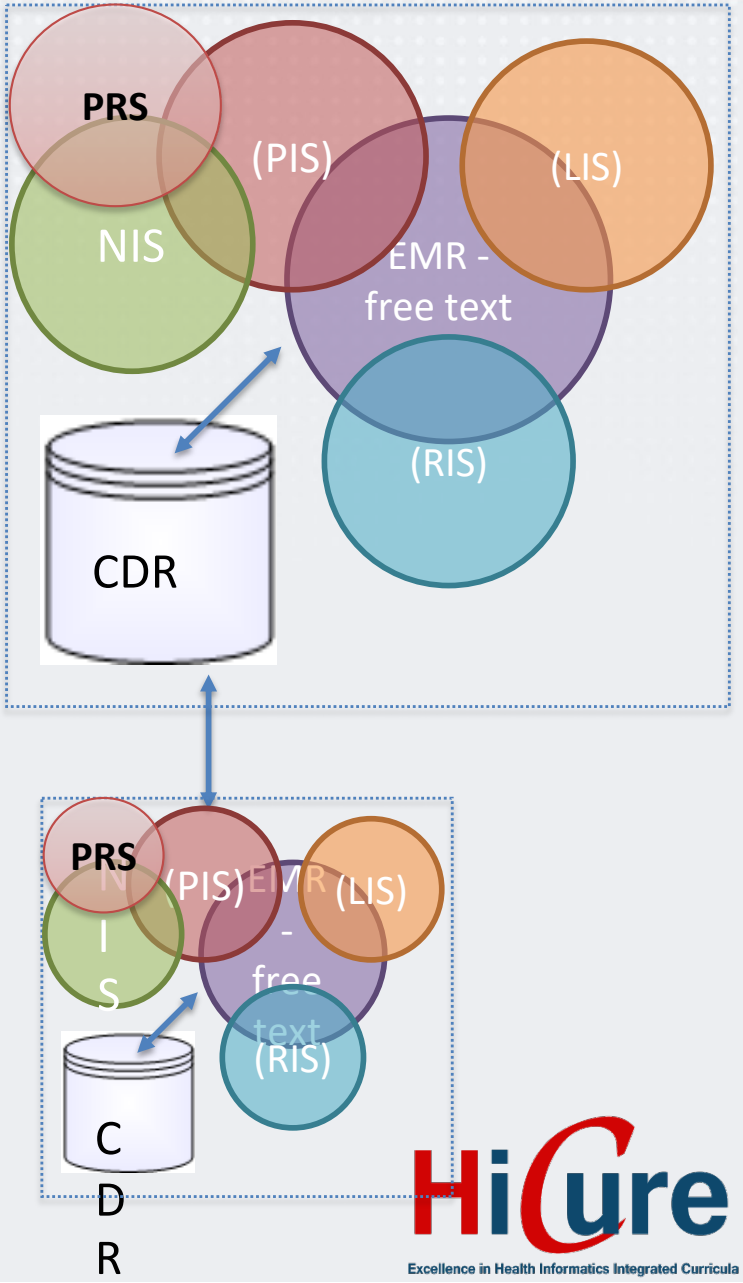
Shareable EHR Adoption Model…

- **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.



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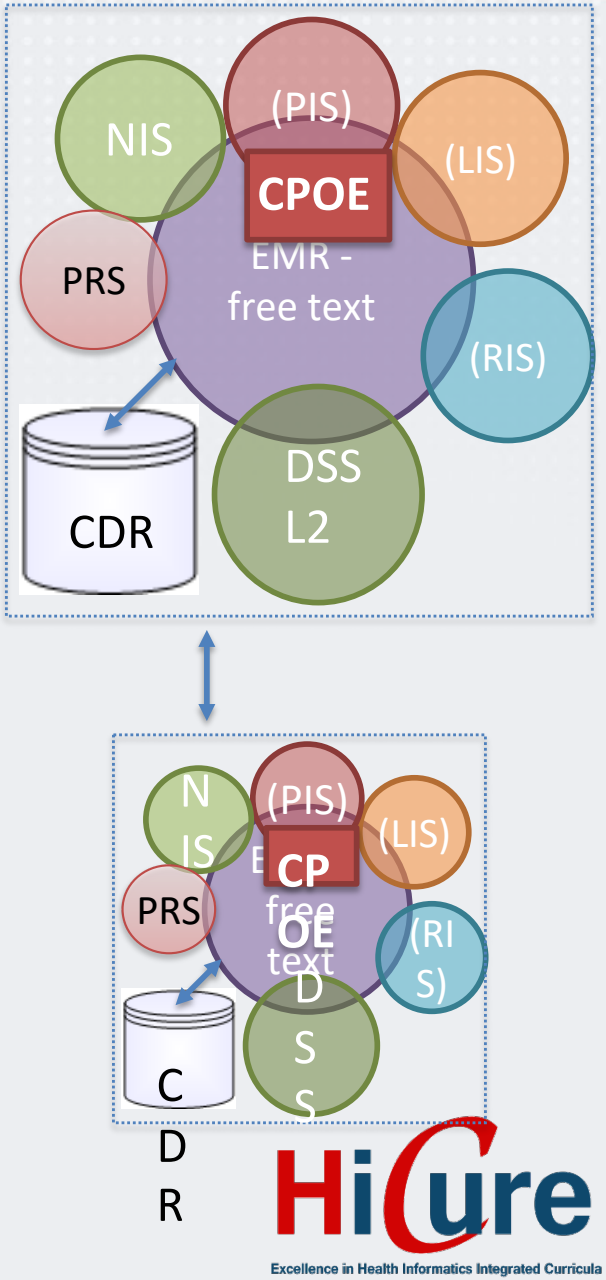
Shareable EHR Adoption Model…

- **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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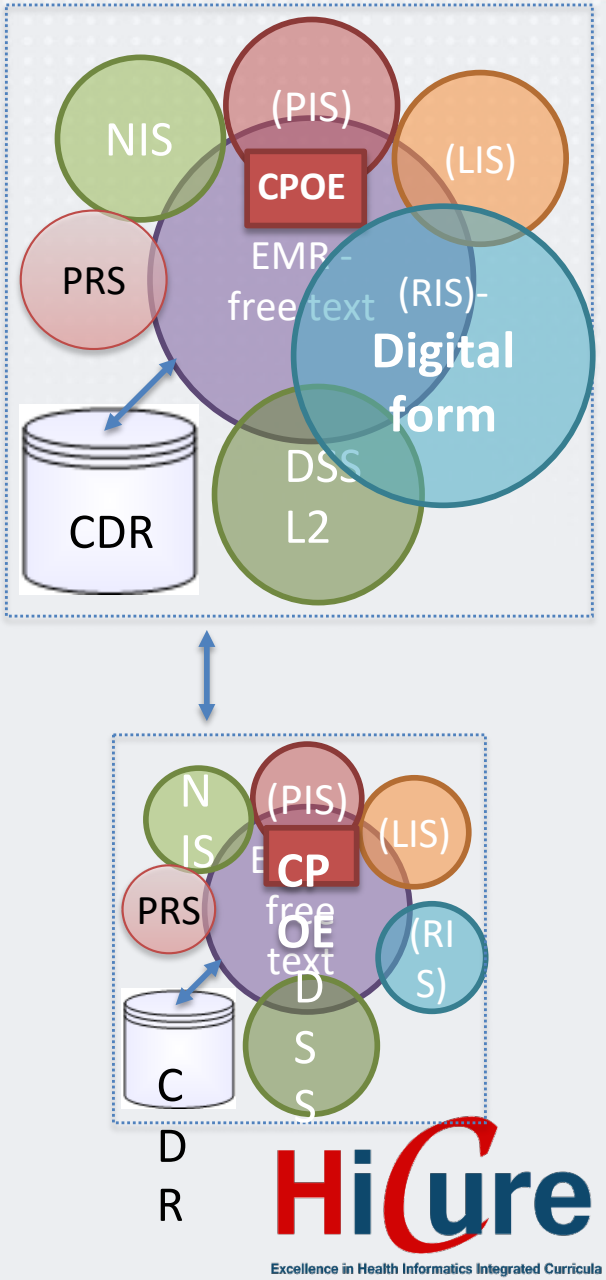
Shareable EHR Adoption Model…

- **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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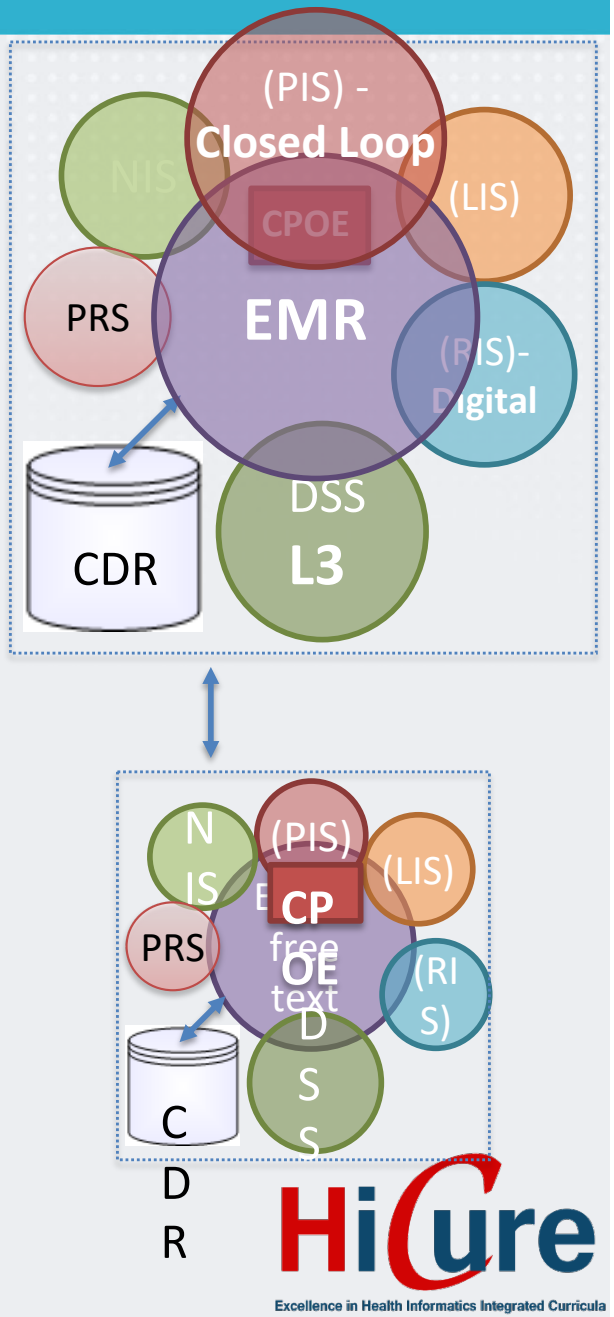
Shareable EHR Adoption Model…

- **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



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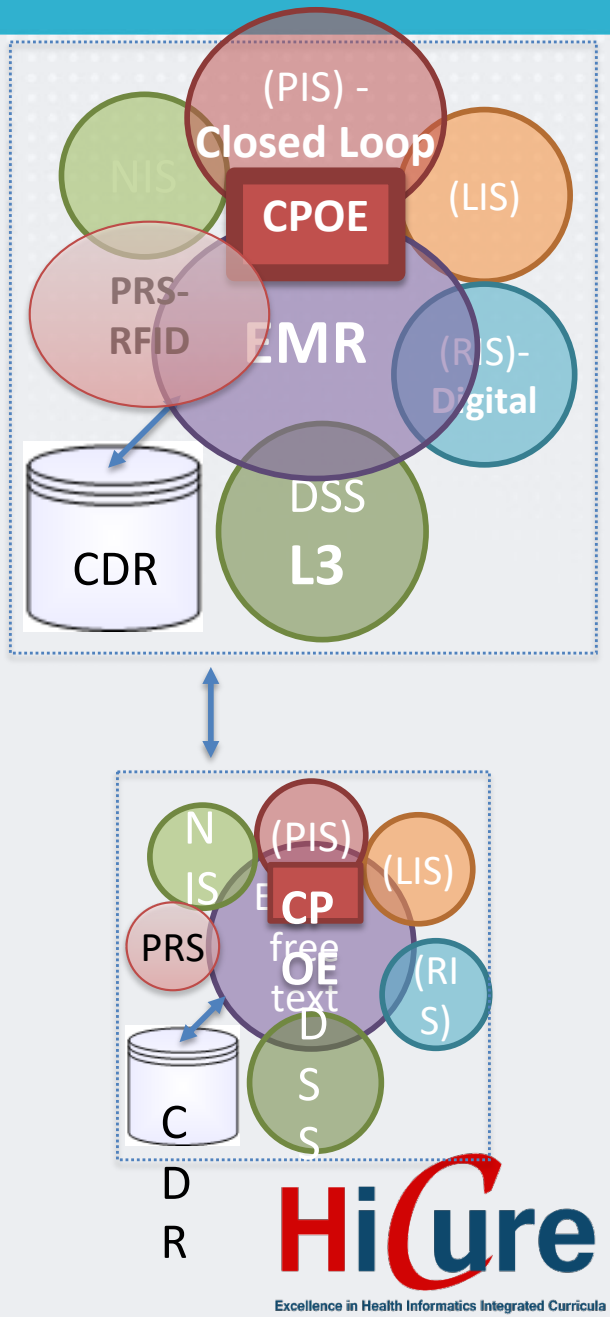
Shareable EHR Adoption Model…

- **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.



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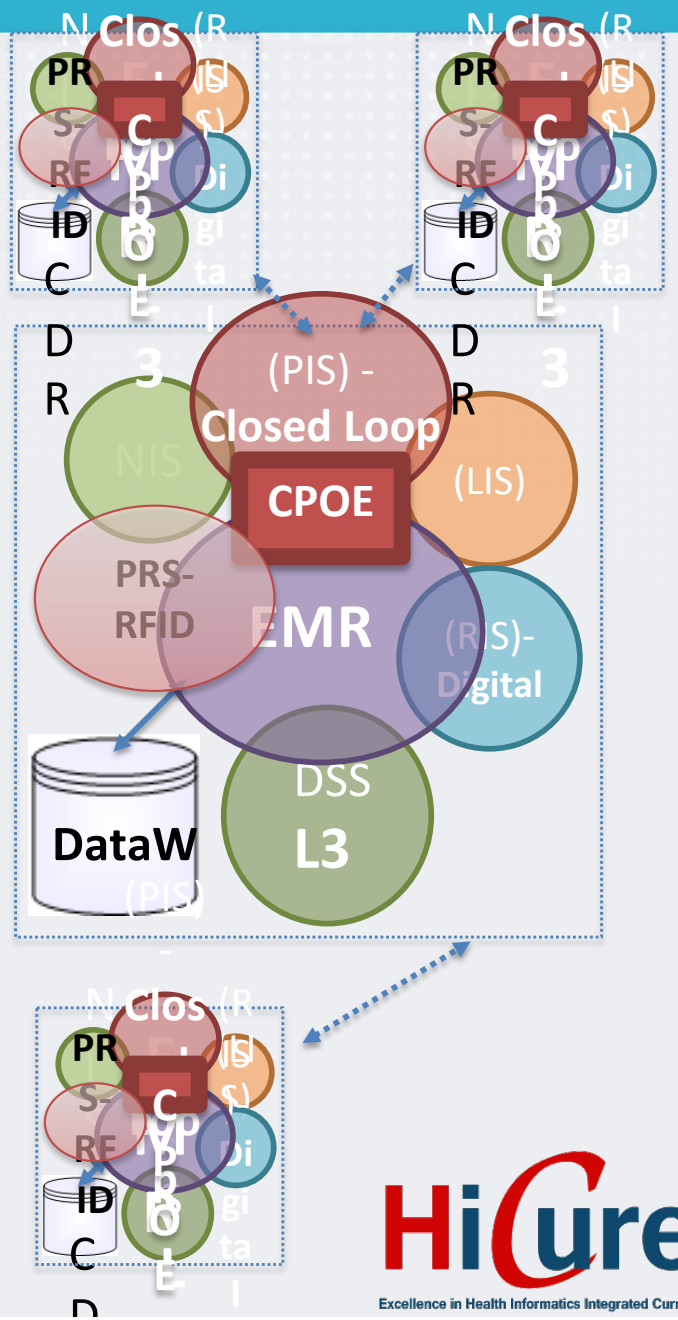
Shareable EHR Adoption Model. (PIS)

- **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)



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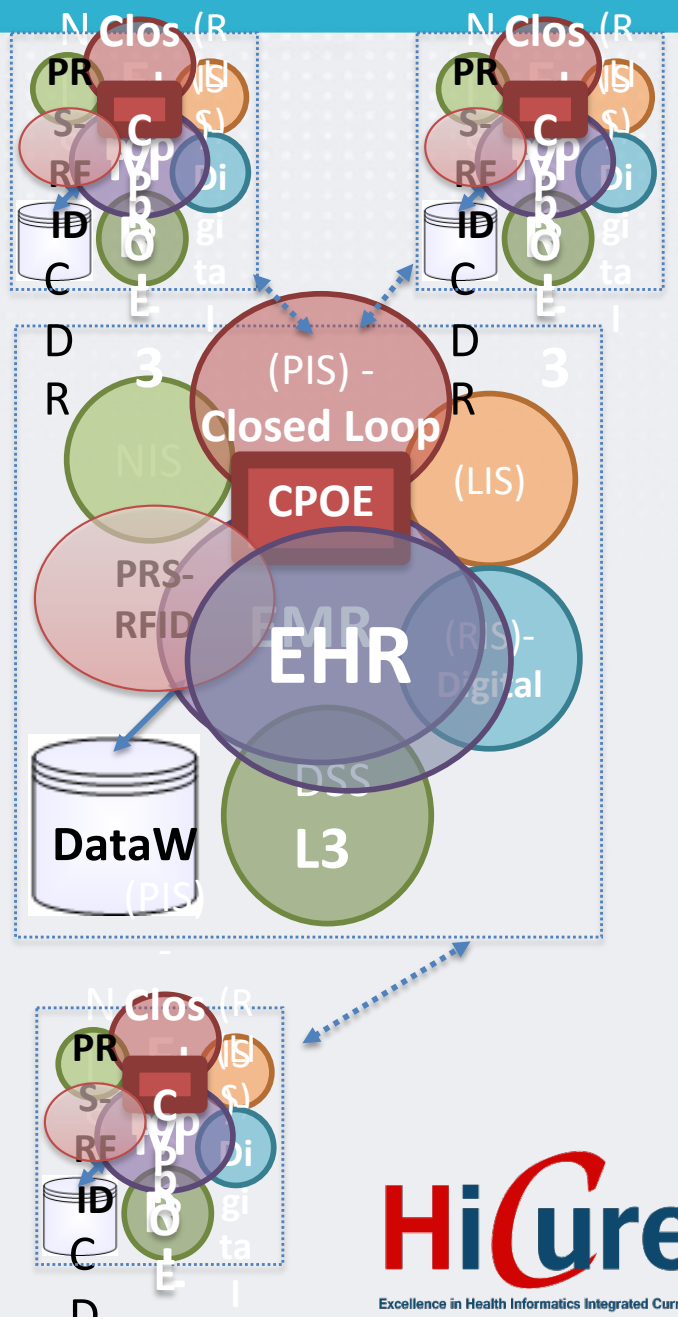
Shareable EHR Adoption Model. (PIS)

- **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.



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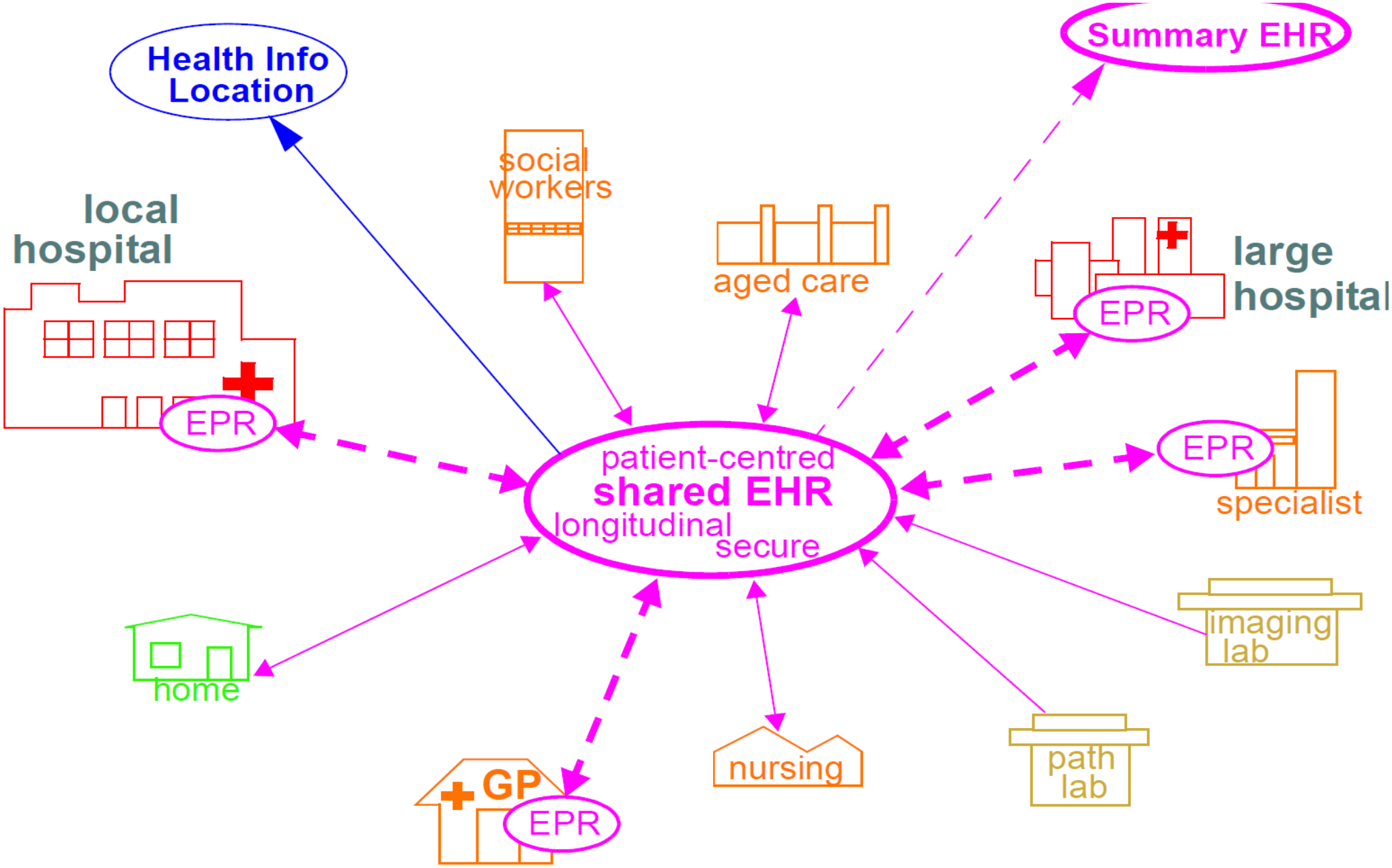

Shared EHR

http://www.openehr.org – 05/02/2017

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