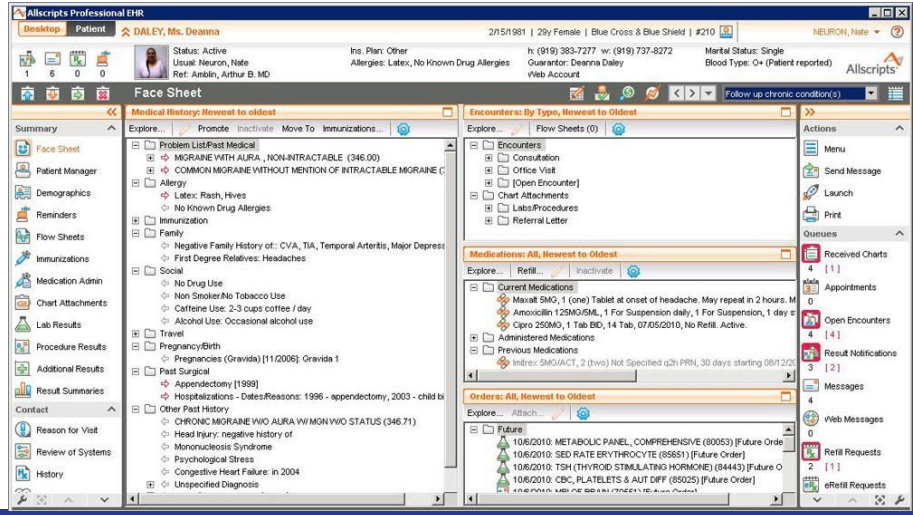
Electronic Health Records (EHRs)

ter.ps/389iweek5

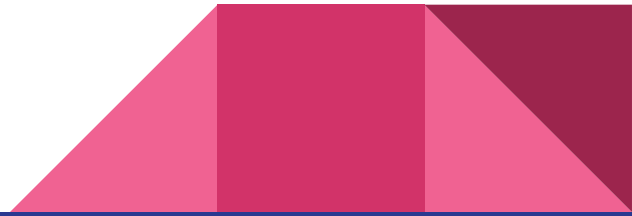
What Are EHRs?

- Electronic Health Records
- Store patient medical information
  - Historical records for the individual hospital
  - Medications & Allergies
  - Doctor notes
  - Insurance and billing info
- Designed to help manage patient info
- Information stored in EHRs



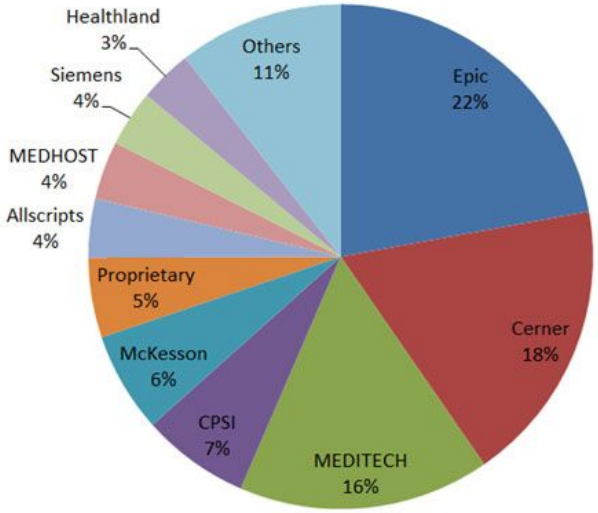
What Information is **NOT** stored in EHRs?

- Medical information from **other** hospital networks
- Historical record of treatment at hospital locations
- Real time information from medical devices
- Raw data from medical devices



Major Players

- Cerner, Epic System, Meditech, Allscripts
  - All have a similar interface for data entry
  - Customized for each individual hospital network
  - Do not operate with each other



https://blog.definitivehc.com/ehr-systems-providers-needs

Regulation

HIPAA

- Health Insurance Portability Accountability Act (U.S. 1996)
- Governs data sharing and privacy
- Key points
  - Stored information needs to be anonymized before use
  - Encrypted transmission and storage of medical data
  - Patients need to give explicit permission for data sharing

FHIR & HL7

- Fast Healthcare Interoperability Resource and Health Level 7
- Industry Standard for data transmission for patient data
- Key improvements:
  - Standardized data transmission and storage for sharing
  - XML to JSON format for data transmission
  - Restful APIs - standardized format to access data
- Issues:
  - Data labels and structure between EHRs can be different
  - Not all EHRs collect the same amount of information

XML

```
<empinfo>
   <employees>
      <employee>
         <name>James Kirk</name>
         <age>40></age>
      </employee>
      <employee>
         <name>Jean-Luc Picard</name>
         <age>45</age>
      </employee>
      <employee>
         <name>Wesley Crusher</name>
         <age>27</age>
      </employee>
   </employees>
</empinfo>
```

JSON

```
{  "empinfo" :
   {
      "employees" :  [
      {
         "name" : "James Kirk",
         "age" : 40,
      },
      {
         "name" : "Jean-Luc Picard",
         "age" : 45,
      },
      {
         "name" : "Wesley Crusher",
         "age" : 27,
      }
                  ]
   }
}
```

https://www.sunnyhoi.com/json-vs-xml-format-use-api/

BAA

- Business Associate Agreement
- Covers liability of patient data under HIPAA
- Required before EHR data can be accessed by a third party
- Fun fact: Amazon Web Services (AWS) now signs BAA agreements

Problems

Issues with Data Collection / Entry

- EHRs often contain data that is not up to date
- Patient reported outcomes hard to quantify & analyze
- Types of data needed for research is not often collected
  - Raw data and measurements
- Human Error
  - Clinicians spend majority of time on data entry
  - Poor user interface
  - Copy paste data
  - Skip fields by accident

Issues with Data Storage

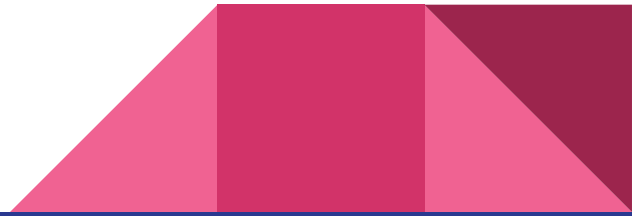
- Inconsistent data formats
- Empty data fields
- Duplicate information
- Inconsistent labelling of data

EHR Interoperability

- Tradeoff between patient safety and regulation
- Competitive advantage for EHRs not to share data
  - Incentive for hospital systems to use the same EHR
  - Consistency of information between hospitals
- Issues:
  - Can prevents patients from going to other hospital networks
  - Limits choice to get treatment
  - Hard to aggregate large quantities of information for research
  - Data sharing between in-network hospitals is still an issue

Regional differences

- Not all countries have EHRs
  - Ex: India - patients carry around paper medical records
- Differing regulations between countries
  - GDPR in Europe
  - Limited access to patient information
  - Big issue when medical issues arise when travelling
- Insurance
  - Policies only cover domestic in network treatment



Further Reading

- https://www.springer.com/us/book/9783319437408
- https://med.stanford.edu/content/dam/sm/ehr/documents/EHR-Poll-Presentation.pdf
- https://www.forbes.com/sites/peterubel/2017/11/24/your-doctor-may-spend-more-time-with-a-computer-than-with-you/
- https://www.wired.com/story/the-battle-to-get-gender-identity-into-your-health-records/