Epic EHR

Identifying Study Populations and Managing Research Studies using Epic Analytics Tools

12/14/2023

The GW Medical Faculty Associates
Introductions

The best way to reach us for questions and requests is to email solutioncenter@mfa.gwu.edu

This will open a support ticket for Epic Reporting
Epic Reporting Tools Overview

- We have four primary Self-Service Analytics tools
- End users need an Epic account to use any of the tools
- We have a team of 5 Business Intelligence analysts to assist you with submitting requests and learning the tools or to assist with custom analytics development as needed.
- We also have a connection to a team of data scientists for more advanced analytical support.
- We have a SharePoint request site to coordinate review and approval of research requests through our Research Advisory Council
Epic Reporting Tools Overview

DASHBOARDS

- Used for visualizing and monitoring multiple data sources and reporting content in one place
- Organized around roles and workflows
- High level views with additional drill down details
Epic Reporting Tools Overview

WORKBENCH

• Real-time, actionable data
• Excel look and feel with limited summarization functionality
• Mostly geared towards finding “my” patients.
Epic Reporting Tools Overview

SLICERDICER

• Best Epic Reporting tool for investigating and identifying MFA populations

• Multiple visualization styles and pre-defined measures

• See all aggregate data, but only see the details for your patients
Epic Reporting Tools Overview

COSMOS

- Deidentified data from hundreds of participating organizations and hundreds of millions of data
- Similar in look and feel to SlicerDicer
- Levels of access from regular end user to Data Scientist
Questions?

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Identifying Research Populations Using the EHR

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What is an Electronic Health Record?

• To a first approximation, it is an electronic version of a patient’s paper chart
  • Administrative and Billing Data
  • Demographics
  • Vital signs
  • Diagnoses
  • Medications
  • Immunization Dates
  • Allergies
  • Lab and Test Results
  • Radiology images
  • Progress notes

Capture evidence needed to make decisions about patient care
Provide workflow management so information can be shared across the organization
Types of Healthcare Data

• The Electronic Health Record
• Administrative data
  • Hospital discharge data
• Claims data
  • Billing data
• Disease registries
  • Specialized tracking of specific disease
• Clinical trial data
• Population Health
  • NHANES
  • Medicare
• Genomic repositories
• Other
EHRs are complex

- They address a variety of needs
- As a result, the traditional relational database approaches become quite unwieldy very quickly

- Epic and Cerner (now Oracle Health) are the two largest EHR vendors
  - Epic is used at the MFA and has probably overtaken Cerner
  - Cerner used at the GW Hospital and Children’s National
A fraction of the Cerner Millenium Database schema. Each table has thousands if not millions of rows of data.

About 30,000 tables the last time I looked.

Many of these tables need to be joined with others to get useful information.
Benefits of Mining EHR and other Healthcare Data

Systematic analysis of patterns

Developing a computational “phenotype” of a disease or a population

Can provide a wealth of information if you have the right access permissions and knowledge

Learning how to use an EHR at a site doesn’t necessarily mean you know how to use the EHR from that vendor at another hospital.

The EHRs are significantly customized
Challenges in Mining EHR and other Healthcare Data

• Ensuring privacy
• Access is restricted for some data elements
• Data is scattered across systems and locked in some instances
• Data cannot be analyzed without extensive data wrangling
• Data from different parts of an organization are in different units
• Data variety
• Important data is kept in unstructured fields

• EHRs are actively in use by clinical staff to enter data; extensive queries can degrade performance for data entry
Cerner Millennium PowerChart

- Cerner was acquired by Oracle and their products and services are undergoing rebranding and renaming
- Millennium PowerChart is the name of the system that includes the Electronic Health Record (EHR)
- Bear TRACKS, Power Chart, Millennium are used interchangeably
- The EHR includes a reporting tool called Discern
  - To get the most out of Discern you will likely need to learn Cerner Command Language (a variant of Structured Query Language)

- Millennium is good for viewing an individual patient record but not well suited for querying across a cohort
Data from these systems feed into Cerner Millennium
From there, data is pulled into HealtheIntent
HealtheIntent

• HealtheIntent is our Enterprise Data Warehouse (EDW)
• HealtheAnalytics is an SQL based workbench to query the EDW
• Find the HealtheAnalytics New User Access Request Job Aid in the Intranet (they keep changing the location of things in there)
  • A search for Discern found GRP_IS_Learning_Clinical Informatics which led to the correct location under Discern Analytics and HealtheAnalytics Materials
  • Instructions in there to have your Network ID added to the correct access groups

• https://childrensnational.analytics.healtheintent.com/
What is HealtheIntent?

- Originally Cerner’s population health platform, aggregates information from the disparate systems shown earlier.
- Unstructured data (notes, images, pdfs) are not included
- Identifiers remain in the data (not deidentified)
- Data are normalized, for example the lab value units are harmonized
- Custom datasets and reports can be created and secured
- Reporting tools are included
HealthIntent/HealthAnalytics

Users with the appropriate access can create their own reports using:

• Business Objects - drag-and-drop reporting to create data tables or patient lists
• Tableau - dashboarding, visual analytics and ad-hoc exploration
• SQL – for more complex data analyses and extracts
• Data Syndication to automatically download raw data files

• Most users will need support to perform queries
  • [https://cnmc.sharepoint.com/sites/GRP_AnalyticsChampions_InformationResources/SitePages/analytics-champions-home.aspx](https://cnmc.sharepoint.com/sites/GRP_AnalyticsChampions_InformationResources/SitePages/analytics-champions-home.aspx)
  • Request Analytic/Reporting/Data Extract at [https://cnmc.sharepoint.com/sites/MyIT](https://cnmc.sharepoint.com/sites/MyIT)

• Training also provided at CNH
Cerner’s counterparts to Epic Slicer Dicer and Cosmos

- HealtheDataLab (nearly ready for use at CNH)
  - Jupyter notebook front end to a Cerner Data Lake incorporating HealtheIntent
    Both Children’s data and Cerner Real World Data
  - Cerner Real World Data
    - Float a query across data provided from Cerner HealthIntent sites
    - >150 million patients
- Cerner Learning Health Network
  - Similar in concept to PEDSnet
  - Also provides access to CRWD
  - A front door request is needed to access, and seats are limited

- These will require familiarity with Python or R as well as a variety of packages for handling large data sets
TriNetX

• Self service cohort discovery tool
  • Can use as part of preparatory to research

• Cloud based health research platform
  • Can query Children’s National, US sites, international sites
  • Clean easy to use interface with crosswalks between common coding systems
Can query

- Demographics
- Diagnosis (ICD-9-CM and ICD-10-CM)
- Medications
- Procedures
- Labs
- Visit Types

Ability to link back to HealthIntent and with an approved IRB protocol
Obtain additional data from the EDW
<table>
<thead>
<tr>
<th>Study Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic Retinopathy (Treatment Naive)</td>
<td><code>- Total Patients</code></td>
</tr>
<tr>
<td>Oncology Templates_Colorectal Cancer</td>
<td><code>- ONCOLOGY TEMPLATE - READ ONLY</code></td>
</tr>
<tr>
<td>thrombotic microangiopathy June23</td>
<td><code>- Total Patients</code></td>
</tr>
</tbody>
</table>
Obtain Summary counts and demographics

- Enter inclusion and exclusion criteria
<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>Patients</th>
<th>% of Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>E00-E89 Endocrine, nutritional and metabolic diseases</td>
<td>240</td>
<td>100%</td>
</tr>
<tr>
<td>R00-R99 Symptoms, signs and abnormal clinical and laboratory ...</td>
<td>230</td>
<td>96%</td>
</tr>
<tr>
<td>Z00-Z99 Factors influencing health status and contact with health</td>
<td>190</td>
<td>79%</td>
</tr>
<tr>
<td>A00-B99 Certain infectious and parasitic diseases</td>
<td>170</td>
<td>71%</td>
</tr>
<tr>
<td>J00-J99 Diseases of the respiratory system</td>
<td>150</td>
<td>63%</td>
</tr>
<tr>
<td>M00-M99 Diseases of the musculoskeletal system and connectiv...</td>
<td>150</td>
<td>63%</td>
</tr>
<tr>
<td>K00-K99 Diseases of the digestive system</td>
<td>140</td>
<td>58%</td>
</tr>
<tr>
<td>G00-G99 Diseases of the nervous system</td>
<td>130</td>
<td>54%</td>
</tr>
<tr>
<td>N00-N99 Diseases of the genitourinary system</td>
<td>130</td>
<td>54%</td>
</tr>
<tr>
<td>F01-F99 Mental, Behavioral and Neurodevelopmental disorders</td>
<td>110</td>
<td>46%</td>
</tr>
<tr>
<td>D00-D89 Diseases of the blood and blood-forming organs and c...</td>
<td>100</td>
<td>42%</td>
</tr>
<tr>
<td>S00-T88 Injury, poisoning and certain other consequences of ex...</td>
<td>100</td>
<td>42%</td>
</tr>
<tr>
<td>H00-H59 Diseases of the eye and adnexa</td>
<td>90</td>
<td>38%</td>
</tr>
<tr>
<td>I00-I99 Diseases of the circulatory system</td>
<td>90</td>
<td>38%</td>
</tr>
<tr>
<td>L00-L99 Diseases of the skin and subcutaneous tissue</td>
<td>80</td>
<td>33%</td>
</tr>
<tr>
<td>Procedure</td>
<td>ICD-10</td>
<td>CPT</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
<td>-----</td>
</tr>
<tr>
<td>SNOMED 128927009 Procedure by method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT 1013625 Evaluation and Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNOMED 243120004 Regimes and therapies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNOMED 362958602 Procedure by site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT 1012569 Medicine Services and Procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT 1003143 Surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT 1011136 Pathology and Laboratory Procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNOMED 363891001 Procedure categorized by device involved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT 1010251 Radiology Procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT 1002796 Anesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCPCS J</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICD-10-PCS 0 Medical and Surgical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNOMED 362961001 Procedure by intent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICD-10-PCS 3 Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICD-10-PCS 4 Measurement and Monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TNX Curat... 10021 Chemotherapy Lines of Treatment (VA Class)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Patients</th>
<th>% of Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH000 Central nervous system medications</td>
<td>190</td>
<td>79%</td>
</tr>
<tr>
<td>DE000 Dermatological agents</td>
<td>190</td>
<td>79%</td>
</tr>
<tr>
<td>TN000 Therapeutic nutrients/minerals/electrolytes</td>
<td>190</td>
<td>79%</td>
</tr>
<tr>
<td>GA000 Gastrointestinal medications</td>
<td>180</td>
<td>75%</td>
</tr>
<tr>
<td>OP000 Ophthalmic agents</td>
<td>180</td>
<td>75%</td>
</tr>
<tr>
<td>AM000 Antimicrobials</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>CV000 Cardiovascular medications</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>HS000 Hormones/synthetics/modifiers</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>NT000 Nasal and throat agents, topical</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>PH000 Pharmaceutical aids/reagents</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>RE000 Respiratory tract medications</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>Other Other medications (va)</td>
<td>170</td>
<td>77%</td>
</tr>
<tr>
<td>GU000 Genitourinary medications</td>
<td>160</td>
<td>67%</td>
</tr>
</tbody>
</table>

### Patient Arrival Rate

Graph showing patient arrival rate over months.
# Analyses

## My Analyses

<table>
<thead>
<tr>
<th>Analyze Outcomes</th>
<th>Compare Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do patients in a cohort experience outcomes?</td>
<td>How do outcomes compare between cohorts?</td>
</tr>
<tr>
<td>Explore Characteristics</td>
<td>Compare Characteristics</td>
</tr>
<tr>
<td>Review Outcomes</td>
<td>Review Outcomes</td>
</tr>
<tr>
<td>Single Cohort</td>
<td>Two Cohorts</td>
</tr>
</tbody>
</table>

## Compare Cohorts

How do patient characteristics compare between cohorts?

**Compare Characteristics**

- Two Cohorts

## Treatment Pathways

In what order do patients receive treatments following a diagnosis?

**Review Characteristics**

- Single Cohort

## Incidence and Prevalence

What are the incidence and prevalence of events of interest in a cohort?

**Review Incidence and Prevalence**

- Single Cohort
To request TriNetX access visit https://is.gd/INSIGHTS

After account is created, can find training materials https://support.trinetx.com/hc/en-us/categories/115000239168
Other Networks

- Other Networks
  - Pedsnet
  - N3C
  - PHIS
  - PCORNET
  - All of US
  - UK Biobank
For more information

• Visit the CTSICN Research Launcher https://ctsicn.org/RL
• Cerner specific information https://ulearn.cerner.com
• GW Library offers several excellent workshops for Python and R
• GW Library also subscribes to O’Reilly Online Learning https://learning.oreilly.com/home-new/
• Children’s has a Special Interest Group called Docs in Data Science and are hoping to expand to GW
• GW Coders meets regularly and may be an opportunity to find students interested in capstone projects
• Email me hiroki@gwu.edu