DaVINCI DoD Source Data: Coding Practices in Military Treatment Facilities

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Purpose

This the <u>second of four</u> webinars that focus on DaVINCI's DoD Electronic Health Record (EHR) and TRICARE claims data sources.

- This webinar will cover:
  - How administrative and clinical data that are captured and coded in the (legacy) DoD Composite Health Care System (CHCS) / Armed Forces Health Longitudinal Technology (AHLTA) EHR
  - How the EHR interacts with the Defense Enrollment Eligibility Reporting System (DEERS) system
  - Impacts on OMOP

DaVINCI Webinar Series

- Webinar #1: Overview Session (Oct 8, 2020)
  - DoD source data capture and processing flow
  - Key differences in coding between DoD EHR data ("direct care") and TRICARE claims ("private sector care")

- **Webinar #2: DoD EHR Data and OMOP**
  - DOD EHR data capture
  - Implications for OMOP

- Webinar #3: DoD TRICARE Claims data and OMOP

- Webinar #4: DoD MHS GENESIS (Cerner EHR) and OMOP

Objectives

After attending the webinar, attendees will be able to:

- Describe the sources, processing flow, and completion lag of DoD EHR data and DEERS and where they interact

- Provide an overview of the main direct care files and how they interact to build episodes of care

- Describe limitations of inpatient professional coding and potential impacts on studies

- Describe non-clinical encounters in direct care data and what information they capture and how it relates to OMOP

Military Health System (MHS)

(A quick recap)

What is the Military Health System?

- The MHS is a network of military hospitals and clinics ('direct care'), supplemented by programs to enable beneficiaries to seek care in the private sector ('private sector care') in order to fulfill their healthcare needs according to access standards and to assure medical readiness of the force.

Our Mission

Enhance the Department of Defense and our nation's security by providing health support for the full range of military operations and sustaining the health of all those entrusted to our care.

Our Vision

Be a world-class health care system that supports the military mission by fostering, protecting, sustaining and restoring health.

What is the Military Health System?

- Eligible Beneficiaries: 9.4 million
- Number of Hospitals: 50+
- Number of Medical Clinics: 500+
- Number of Dental Clinics: 300+
- Inpatient Admissions to Military Hospitals: 240K
- Inpatient Admissions in the Private Sector: 770K
- Office Visits in Military Hospitals/Clinics: 41M
- Office Visits in the Private Sector: 86M
- Number of Prescriptions from Military Pharmacies: 34M
- Number of Prescription from the Private Sector: 55M

Direct Care

- MHS Direct Care System
  - Refers to the acute care hospitals, clinics, and dental facilities operated by DoD.
    - Most of the hospitals are small facilities. There are only 6 hospitals with more than 100 patients in their average daily census and scores of hospitals with less than 50. OB is the most popular service provided in MTFs.
    - Many hospitals have Graduate Medical Education programs.
    - Clinics can vary from those serving only Active Duty for primary care needs, to full-service clinics with same day surgeries and such.
    - The MHS has an active patient centered medical home (PCMH) program, which most MTFs participate in.
  - There is no cost sharing (other than paying for food for some patients) for care at MTFs. Can be particularly useful when studying the impacts of cost-sharing on access to care.
  - There is an established priority for care and in some places, eligible beneficiaries cannot get appointments at MTFs.
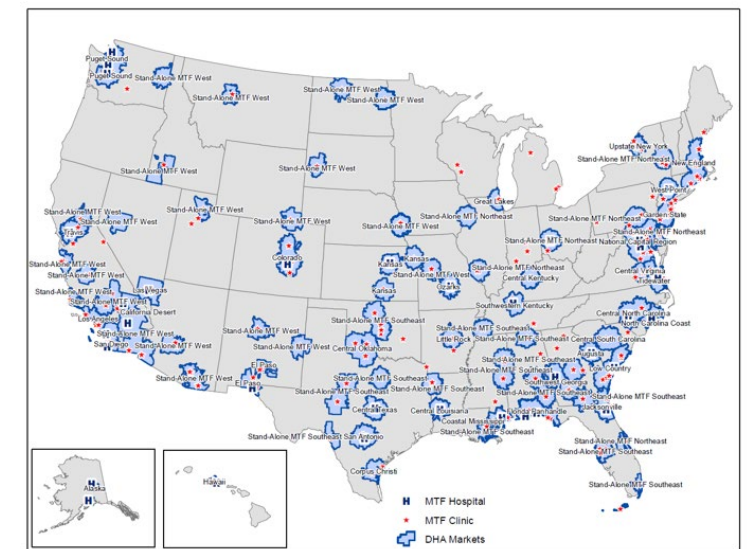
Data Available in Direct Care

Composite Health Care System (CHCS) & Armed Forces Health Longitudinal Technology (AHLTA) EHR

Source	Name	Content
Standard Inpatient Data Record	SIDR	Inpatient Hospital
Comprehensive Prof Encounter Record	CAPER	Professional Services
Appointment	APPT	Appointments
Referral	REF	Referrals (MTF or Purchased Care)
Chemistry	Chem	Chemistry Exams & Results
Microbiology	Micro	Microbiology Exams & Susceptibility
Pathology	Path	Pathology Exams & Results
Radiology	Rad	Radiology Exams & Results
Schedulable Entity	SE	MTF Appointment Schedules
Pharmacy	RX	Dispensing Events
Subjective/Objective Notes	SO	Clinical Notes (AHLTA based only)
Immunizations	IMM	Immunization History
Vital Signs	Vitals	Vitals and Other questionnaire type data

Mapping DoD Source Data to DoD OMOP Clinical Tables

- Advantage of OMOP is that data are mapped from many source tables (e.g., multiple EHR and claims files) to a limited set of standardized tables that allow for easier use.

  - Can write one query to pull all Emergency Department Procedures instead of looking at CAPER and TED-NI

- Very little data cleaning is done during the transformation into the OMOP CDM
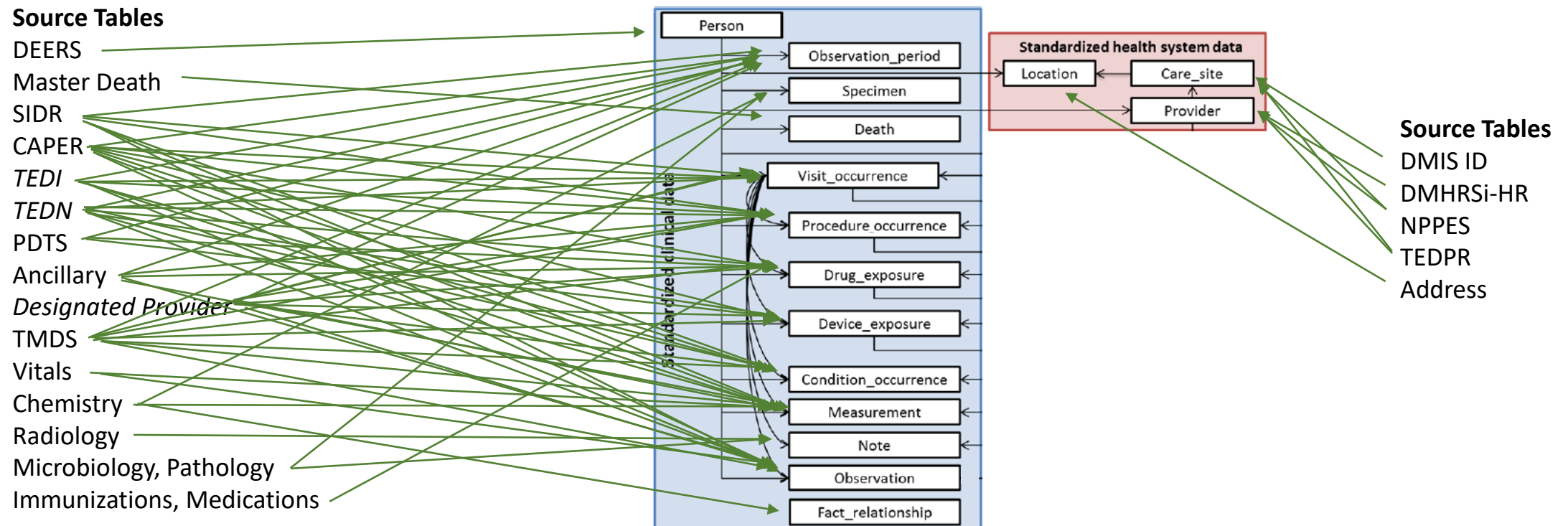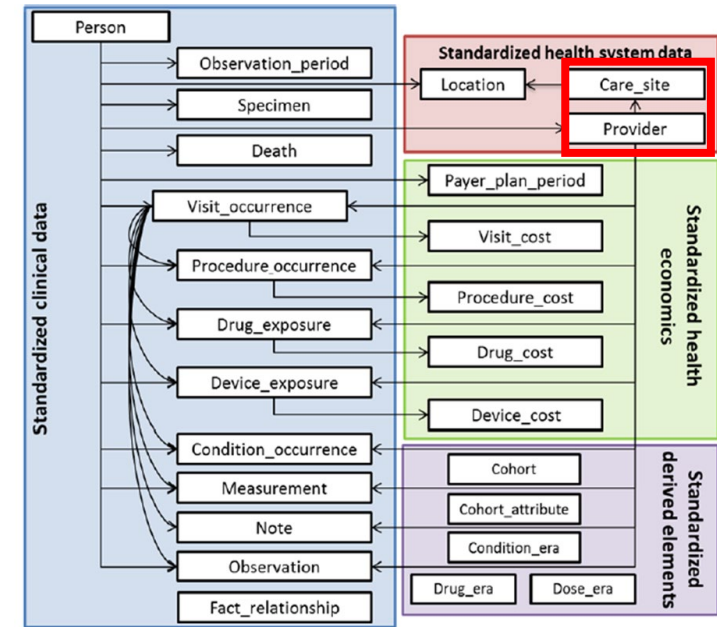
Reporting DoD Care at MTFs

Source Data & the Care Site (WHERE) and Provider (WHO) OMOP tables

Military Treatment Facility Identifier DMIS ID

- Treatment DMIS ID
  - Similar to VA Station
  - Defense Medical Information System Identifier
  - Used for reporting of direct care data, including external resource sharing (ERSA) provider workload (where DoD provider provides care at a non-military facility; such as the VA).
  - Represents the facility where care is provided or where the ERSA provider is assigned.
  - 4-character code, it is customary to keep all 4 characters
  - Falls within a Hierarchy:
    - Service, Command, Parent, Market, Region

Example DMISIDs (2019)

DMIS ID	DMIS ID Name	DMIS ID Command	DMIS ID Military Service
0029	NMC SAN DIEGO	NAVMED_W	N
0032	ACH EVANS-CARSON	RHC-C	A
0033	AF-ASU-10th MEDGRP-ACADEMY	USAFA	F
0067	WALTER REED NATL MIL MED CNTR	TIMO	P
0418	USCG CLINIC ALAMEDA		C
5486	ERS-AF-SUNRISE HOSP-CIV	ACC	G

DMIS ID 5486: An Air Force Provider goes to Sunrise hospital to deliver care…

Markets

- The market structure provides the management framework for MTFs as they transition to DHA Authority.

- Markets collect up MTFs in a local area except for the Stand- Alone MTF Markets

Tidewater Market

Treatment DMISID Military Service

- Indicates the department that operates the MTF.
- Service branches are changing to P is sites transition to DHA Authority
- RS = Resource Sharing.
  - When an MTF provider delivers care in a private sector facility or VA facility.
  - The provider submits a direct care encounter record using a Resource Sharing DMIS ID.
- There are also values for non-MTFs, such as C=Coast Guard.
- I = Inactive

Service	DHP	Civilian RS	VA RS	Line
Army	A	B	1	D
Air Force	F	G	3	L
Navy	N	R	2	Q
DHA	P	5	6	N/A

Service of the facility (MTF) can be important as coding guidance can differ across services.
- *Example: Immunizations Capture (Air Force – ASIMS), Linking Mom's and Newborns, capturing Tcons*

Military Service and Resource Sharing

Example Resource Sharing CAPERs for one stay

Tmt DMIS ID	Tmt DMIS ID Military Service	Pseudo Person ID	Encounter Date	MEPRS3 Code
5401	R	014E95C8F1	12/06/2017	AEA
5401	R	014E95C8F1	12/07/2017	AEA
5401	R	014E95C8F1	12/08/2017	AEA
5401	R	014E95C8F1	12/09/2017	AEA

- Records represent a beneficiary receiving care from a military doctor at a private sector hospital.
- Both direct and purchased care in one event!

Associated Resource Sharing Institutional claim for same stay

Pseudo Person ID	MS-DRG	MS-DRG Description	Admission Date	End Date Of Care
014E95C8F1	470	MAJOR HIP/KNEE JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W/O MCC	12/06/2017	12/09/2017

Transition to DHA

FY	DMIS ID	DMIS ID Name	DMIS ID Military Service	Readiness Service	DMIS ID Command
2018	0039	NH JACKSONVILLE	N	N	NAVMED_E
2018	0067	WALTER REED NATL MIL MED CNTR	P	N	NCR
2018	0089	AMC WOMACK-BRAGG	A	A	RHC-A
2018	0090	AF-C-4th MEDGRP-SJ	F	F	ACC
2018	0123	FT BELVOIR COMMUNITY HOSP-FBCH	P	A	NCR
2018	0335	AF-LS-43rd MED SQ-JBBP-POPE	F	F	AMC

FY	DMIS ID	DMIS ID Name	DMIS ID Military Service	Readiness Service	DMIS ID Command
2019	0039	NH JACKSONVILLE	P	N	TIMO
2019	0067	WALTER REED NATL MIL MED CNTR	P	N	TIMO
2019	0089	AMC WOMACK-BRAGG	P	A	TIMO
2019	0090	AF-C-4th MEDGRP-SJ	P	F	TIMO
2019	0123	FT BELVOIR COMMUNITY HOSP-FBCH	P	A	TIMO
2019	0335	AF-LS-43rd MED SQ-JBBP-POPE	P	F	TIMO

- Examples of MTFs switching to or under DHA authority.

- Note that the "Readiness Service" contains the historical affiliation of the MTF

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Military Treatment Facilities:
Parents and Children

- DMIS ID vs. Parent DMIS ID

- Treatment Parent DMIS ID
  - Contains DMIS ID of primary entity responsible for reporting data for one or more MTFs.
  - Parent/Child relationships determined by Services.
  - Example:
    - Child DMISIDs (outlying clinics) as part of a parent.
    - Resource sharing DMISIDs, associated with a parent.

- The difference between parent and child level reporting can be extreme!

Parent DMIS ID	Parent DMIS ID Name	DMIS ID	DMIS ID Name	DMIS ID Military Service
0028	NH LEMOORE	0028	NH LEMOORE	N
	NH LEMOORE	0319	NBHC FALLON	N
	NH LEMOORE	1675	BDC NAVPGSCOL MONTEREY	N
	NH LEMOORE	5414	ERS-NAVY-HANFORD COMM MED-CIV	R
	NH LEMOORE	6302	OP FORCES-NH LEMOORE	N

Military Treatment Facilities:
Parents and Children

How many prescriptions at Fort Hood?

Tmt Parent DMIS ID	Tmt DMIS ID	Tmt DMIS ID Name	Number of Scripts	Percentage:
0110	0110	AMC DARNALL-HOOD	902,824	73.15%
0110	1592	MONROE CONSOLIDATED-HOOD	35,602	2.88%
0110	1601	TMC-14-HOOD	5,839	0.47%
0110	6014	CHARLES MOORE HLTH CLN-HOOD	81,373	6.59%
0110	6076	RUSSELL COLLIER HLTH CLIN-HOOD	60,953	4.94%
0110	6109	CBMH WEST KILLEEN-HOOD	2	0.00%
0110	6111	CBMH HARKER HEIGHTS-HOOD	35,456	2.87%
0110	6112	CBMH KILLEEN-HOOD	36,418	2.95%
0110	6113	CBMH COPPERAS COVE-HOOD	32,066	2.60%
0110	7236	BENNETT FAM CARE CLINIC-HOOD	43,662	3.54%
			Percentage:	100.00%

Capturing Location of DoD Direct Care at MTFs

Table	Tmt DMIS ID
SIDR	X
CAPER	X
Ancillary	X
Vitals	X
MEPRS	X
Dental	X
Pharmacy	X
DMISID Index	X
Immunizations	X
Clinical Data (e.g. results)	X
TED-I	
TED-N	

Capturing Location of DoD Direct Care at MTFs

care_site

- ❑ care_site_id
- ❑ care_site_name
- ❑ place_of_service_concept_id
- ★ location_id
- ❑ care_site_source_value
- ❑ place_of_service_source_value

Table	Tmt DMISID
SIDR	x
CAPER	X
Ancillary	X
Vitals	X
MEPRS	X
Dental	X
Pharmacy	X
DMISID Index	X
Immunizations	x
TED-I	
TED-N	
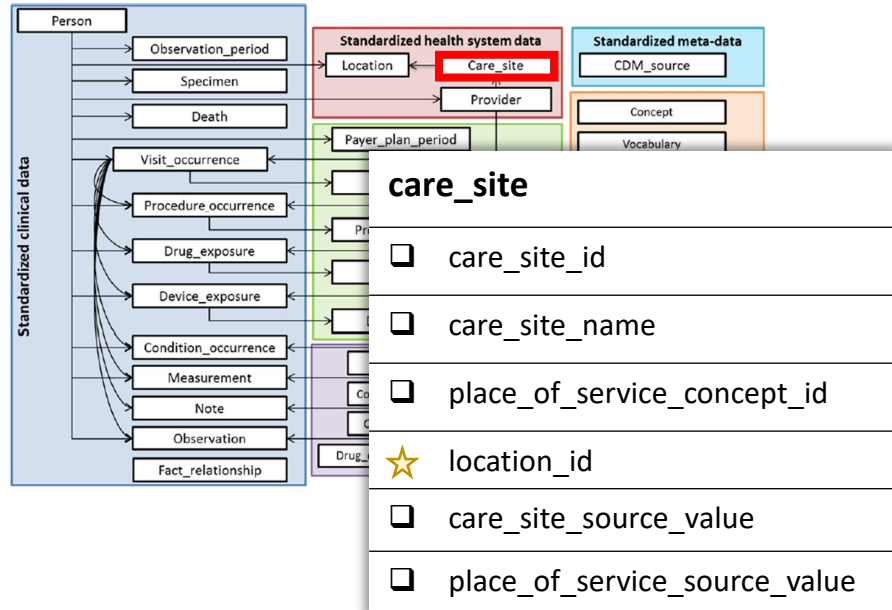
- Care sites are unique locations where healthcare is delivered (e.g. hospitals, clinics, offices, etc.)

- For DoD direct care data, this would include Military Treatment Facilities (MTFs) and parts of MTFs, and resource sharing locations indicated by DMIS ID.

- For VA direct care data, this would include Veterans Affairs Medical Centers (VAMCs) and parts of VAMCs

- Purchased care data will be covered later!

Who performed the care?
Provider table

provider	
🔑	provider_id
❑	provider_name
❑	npi
❑	dea
❑	specialty_concept_id
☆	care_site_id
❑	year_of_birth
❑	gender_concept_id
❑	provider_source_value
❑	specialty_source_value
❑	specialty_source_concept_id
❑	gender_source_value
❑	gender_source_concept_id

- Providers are unique individuals providing healthcare including physicians, nurses, physical therapists, etc.

- Providers can link to healthcare records (visits, procedures, etc.) as well as the Person table (e.g. Primary Care Managers) and the Care_site table (where does the provider work?)

Who performed the care?
Provider table

provider

- 🔑 provider_id
- ☐ provider_name
- ☐ npi
- ☐ dea
- ☐ specialty_concept_id
- ⭐ care_site_id
- ☐ year_of_birth
- ☐ gender_concept_id
- ☐ provider_source_value
- ☐ specialty_source_value
- ☐ specialty_source_concept_id
- ☐ gender_source_value
- ☐ gender_source_concept_id
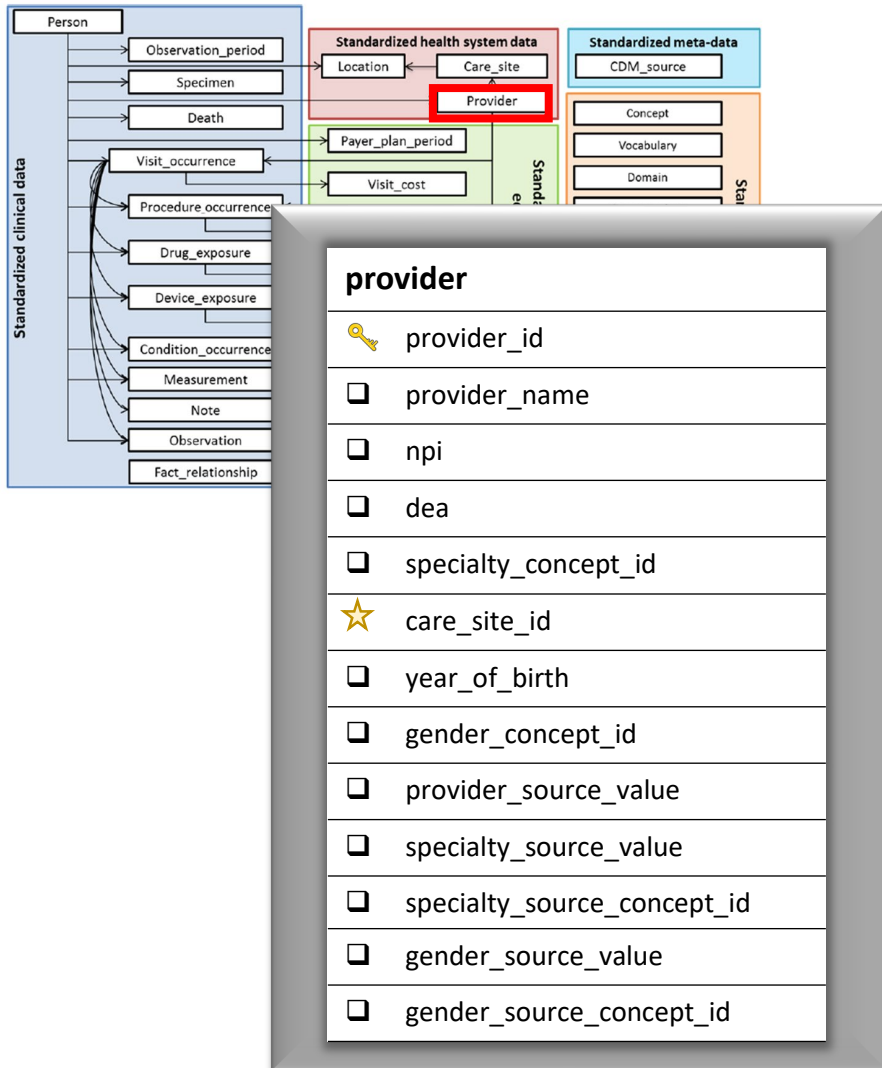
- Uniquely identifying a provider can also be difficult, especially in the DoD data because there are so many different kinds of Provider IDs and often no way to link records for a given provider

  - Across different source files, providers can be identified by NPI, EDIPN, CHCS Provider ID, Tax ID, DEA number, SSN, MCSC Internal Provider Number, CDR Provider ID, etc.

	CAPER (Comprehensive Ambulatory/Professional Encounter Record) Enhanced					
Common File Name: fyXX.sas7bdat, where XX=05+						
Dataset Location: /mdr/pub/caper/enhanced/fyXX.sas7bdat, where XX=05+						
Update Frequency: Current FY weekly; Prior FY weekly for one quarter (Oct-Dec), April, and October; Previous years annually or as needed.				**Source System:** CHCS / ADS		
Description: Patient-Level Comprehensive Ambulatory/Professional Encounter Record - Enhanced						
Data Element	**Definition**	**Format**	**SAS Variable Name**	**Values**	**Notes**	
Appointment Provider EDIPN	Provider's EDI_PN as assigned by DEERS.	Char(10)	PROVEDIPN1			
Appointment Provider HIPAA Taxonomy	HIPAA Provider Taxonomy Code entered on the encounter for the appointment provider.	Char(10)	PROVHIPAA1			
Appointment Provider ID	Unique provider identifier for the provider rendering care.	Char(9)	PROVID1		Entered by MTF staff, the Provider ID normally consists of eight characters of the provider's last name and first initial of first name, or some combination of last name A-numeric characters to arrive at a unique identifier (unique to the CHCS site).	
Appointment Provider NPI	NPI number for the appointment provider.	Char(10)	PROVNPI1			
Appointment Provider NPI Type	The NPI entity type.	Char(1)	PROVNPITYPE 1	1, 2	1 = Individual providers 2 = Organizational providers	
Appointment Provider Role	The role of the appointment provider.	Char(1)	PROVROLE1	1-9	1 = Attending provider 2 = Assisting provider 3 = Supervising provider 4 = Nurse 5 = Para-professional 6 = Operating Provider #1 7 = Surgeon 8 = Anesthesia 9 = GME	
Appointment Provider Specialty Code	A code that identifies the health service provider's medical specialty. Codes and meanings come from CHCS (938 values).	Char(3)	PROVSPEC1	CHCS codes.	See *Provider Specialty Codes for DC* for codes and descriptions.	
Appointment Provider Military Status	The provider military status at the time of the extract date. This value comes from CHCS on the CAPER record.	Char(3)	PROVSTAT1	AD, CI, NG, PV, RC, RS	AD = Active Duty CI = Civilian NG = National Guard PV = Private sector contracts RC = Recalled to Active Duty RS = Reserves	
Appointment Provider Type Code		Char(1)	PROVTYPE1	B, C, F, H, P, T	B = Fee basis C = Certification & Accreditation (C&A) F = Full time H = House staff P = Partnership T = Part time	

Who performed the care?
Provider table
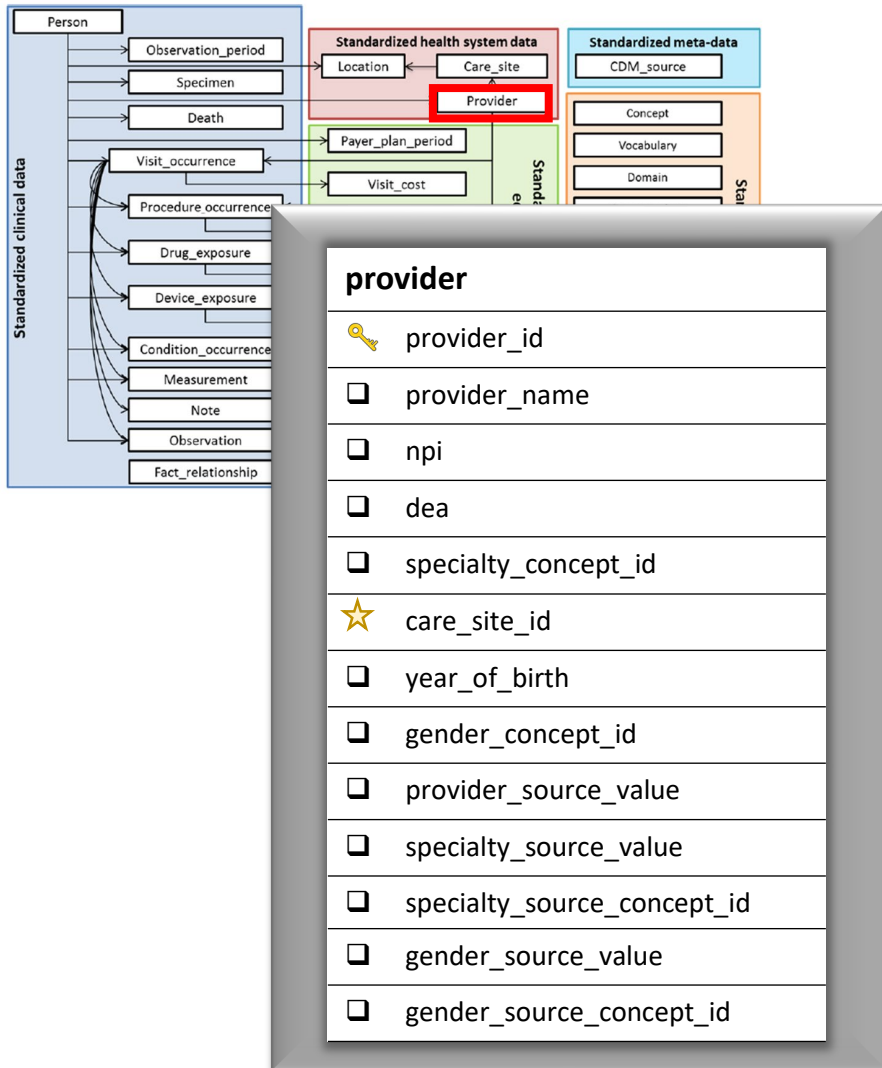
- DoD Data also has 3 different Provider Specialty Code Sets that had to be mapped.

  - Direct Care Specialty (at MTFs)

  - Purchased Care Specialty (in TRICARE Claims)

  - HIPAA Taxonomy (MTFs & TRICARE Claims)

Provider Specialties

Provider Specialty Codes for Direct Care

Code	Description	Status	CAPER Skill Type
000	General Medical Officer		1
001	Family Practice Physician		1
002	Contract Physician (Not On Consultant List)	inactive, FY08	N
003	Family Practice Physician Resident/Intern With License		1R
004	Emergency Physician		1
005	Emergency Physician Resident/Intern With License		1R
006	Emergency Physician Resident/Intern Without License		4
007	Family Practice Physician Resident/Intern Without License		4
008	Internal Med Physician/Clinical Cardiac Electrophysiology		1
010	Internal Medicine Resident/Intern Without License		4
011	Internist		
012	Allergist		
013	Oncologist		
014	Cardiologist		
015	Cardiopulmonary Laboratory Physician		
016	Endocrinologist		
017	Geriatrician		
018	Gastroenterologist		
019	Hematologist		
020	Rheumatologist		
021	Pulmonary Diseases Physician		
022	Infectious Diseases Physician		
023	Metabolic Diseases Physician		
024	Nephrologist		
025	Medical Geneticist		
026	Tropical Medicine Physician		
027	Nuclear Medicine Physician		
028	Internal Medicine Resident/Intern With License		
033	Pediatrician/Pediatric Developmental - Behavioral		
034	Pediatrician/Pediatric Medical Toxicology		
035	Pediatrician/Pediatric Critical Care Medicine		

Provider Specialty Codes for Purchased Care

Code	Description
01	General Practice
02	General Surgery
03	Allergy
04	Otology, Laryngology, Rhinology
05	Anesthesiology
06	Cardiovascular Disease
07	Dermatology
08	Family Practice
10	Gastroenterology
11	Internal Medicine
13	Neurology
14	Neurosurgery
16	Obstetrics/Gynecology
18	Ophthalmology
19	Oral Surgery (Dentists only)
20	Orthopedic Surgery
22	Pathology
24	Plastic Surgery
25	Physical Medicine and Rehabilitation
26	Psychiatry
28	Proctology
29	Pulmonary Diseases

Provider Specialty, HIPAA Taxonomy

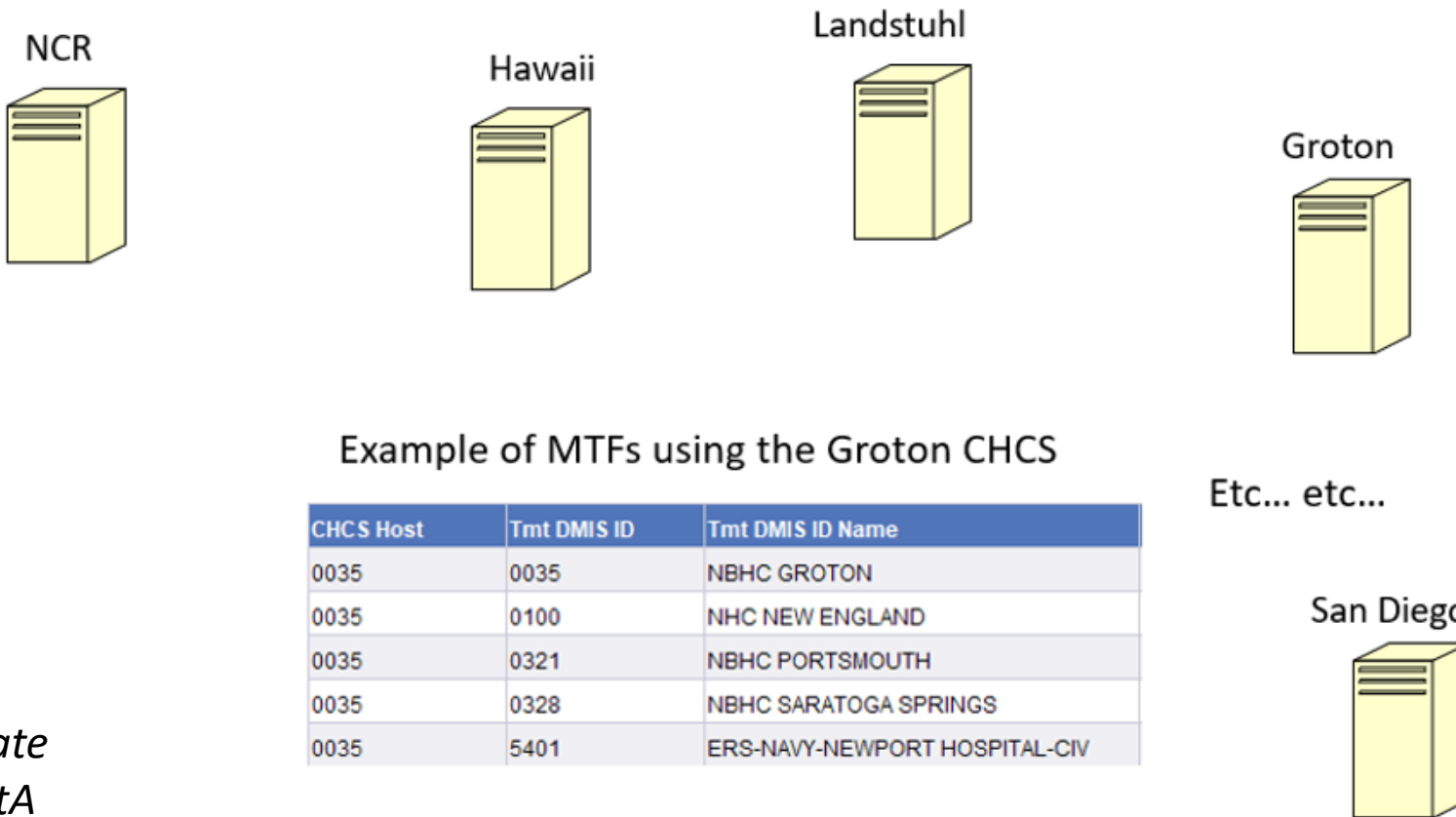| HIPAA Code Current to NUCC Version January 2016	Short Description	Taxonomy Subdivision	CAPER Skill LEVEL (1= Clinician; 2= Direct Care Professional; 3= RN; 4= Direct Care Para-Professional; 5= administrative/clerical; 9=facility; N= inactive; X=Other)
207NI0002X	Dermatology: Clinical & Lab Immunology (Physician)	Allopathic & Osteopathic Physician	1
207NP0225X	Dermatology: Pediatric (Physician)	Allopathic & Osteopathic Physician	1
207NS0135X	Dermatology: Procedural (Physician)	Allopathic & Osteopathic Physician	1
207P00000X	Emergency Medicine (Physician)	Allopathic & Osteopathic Physician	1
207PE0004X	Emergency Medical Services (Physician)	Allopathic & Osteopathic Physician	1
207PE0005X	Emergency Medicine: Undersea & Hyperbaric Medicine (Phys	Allopathic & Osteopathic Physician	1
207PH0002X	Emergency Medicine: Hospice and Palliative Medicine (Physi	Allopathic & Osteopathic Physician	1
207PP0204X	Emergency Medicine: Pediatric (Physician)	Allopathic & Osteopathic Physician	1
207PS0010X	Emergency Medicine: Sports Medicine (Physician)	Allopathic & Osteopathic Physician	1
207PT0002X	Emergency Medicine: Medical Toxicology (Physician)	Allopathic & Osteopathic Physician	1
207Q00000X	Family Practice (Physician)	Allopathic & Osteopathic Physician	1
207QA0000X	Family Practice: Adolescent (Physician)	Allopathic & Osteopathic Physician	1
207QA0401X	Family Practice: Addiction (Physician)	Allopathic & Osteopathic Physician	1
207QA0505X	Family Practice: Adult (Physician)	Allopathic & Osteopathic Physician	1
	Family Practice: Obesity (Physician)	Allopathic & Osteopathic Physician	1
	Family Practice: Geriatric (Physician)	Allopathic & Osteopathic Physician	1
	Family Practice: Hospice and Palliative (Physician)	Allopathic & Osteopathic Physician	1
	Family Practice: Sports (Physician)	Allopathic & Osteopathic Physician	1
	Family Practice: Sleep (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine: Adolescent (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine: Advanced Heart Failure & Transplant Car	Allopathic & Osteopathic Physician	1
	Internal Medicine: Adult Congenital Heart Disease (Physicia	Allopathic & Osteopathic Physician	1
	Internal Medicine: Allergy & Immunology (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine: Addiction (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine: Obesity (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine: Cardiovascular Disease (Physician)	Allopathic & Osteopathic Physician	1
	Internal Medicine: Clinical Cardiac Electrophysiology	Allopathic & Osteopathic Physician	

DoD Electronic Health Record (EHR)

Direct Care

Data Collection and Data Flow

CHCS – Composite Healthcare System

Data Collection
CHCS Hosts – Separate Servers

NCR

Hawaii

Landstuhl

Groton

Etc... etc...

San Diego

Example of MTFs using the Groton CHCS

CHCS Host	Tmt DMIS ID	Tmt DMIS ID Name
0035	0035	NBHC GROTON
0035	0100	NHC NEW ENGLAND
0035	0321	NBHC PORTSMOUTH
0035	0328	NBHC SARATOGA SPRINGS
0035	5401	ERS-NAVY-NEWPORT HOSPITAL-CIV

Similar to separate instances of VistA

Data Collection
CHCS - AHLTA - Essentris

- CHCS was historically the main system used by MTFs to record healthcare events. Medical records were maintained on paper, and diagnosis and procedure codes were entered to represent the care provided.

- The AHLTA project was initially developed to provide an electronic health record for DoD (in the 90s)
  - AHLTA is completely reliant upon CHCS
  - CHCS sends data to AHLTA in real-time, such as patient, appointment, lab, rad and pharmacy information
  - The only healthcare data from AHLTA that is part of the DQ program is the professional service data
  - When providers document in AHLTA, AHLTA sends professional service records back to CHCS (called the write-back)

- But AHLTA only works in office-based settings, so many MTFs got Essentris to use for other locations of care

- **Data from Essentris is NOT available in DaVINCI**

Important Patient Data to Watch in CHCS

- Since CHCS Hosts do not communicate with one another it is possible for important identifying fields that do not originate directly from DEERS to have different values across CHCS. (PIT errors can also cause this)
  - Sometimes this even happens within a CHCS Server
  - Cannot ensure consistent data collection for locally assigned variables. MTFs must be diligent
- Family member prefix (FMP) is a very good example
  - The FMP describes the relationship between a beneficiary and a sponsor, and
  - Contains an "order" number to discern between family members
  - Different order numbers are often assigned to the same patient

One MTF says this dependent is 1st child of the sponsor. The other says the 2nd.

Tmt DMIS ID	Pseudo Person ID	Pseudo Sponsor ID	FMP
0049	015B5059E4	22918C571	02
0057	015B5059E4	22918C571	01

Data Flow: CHCS – AHLTA

CHCS Appt Module

AHLTA

CHCS ADM

CCE

CDR

Coding edits do not flow to CDR/CDM

APPT

APPT

CAPER

ADM + AHLTA Records are in CAPER file for MDR

Professional encounters do not flow directly to MDR but clinical data does

MDR
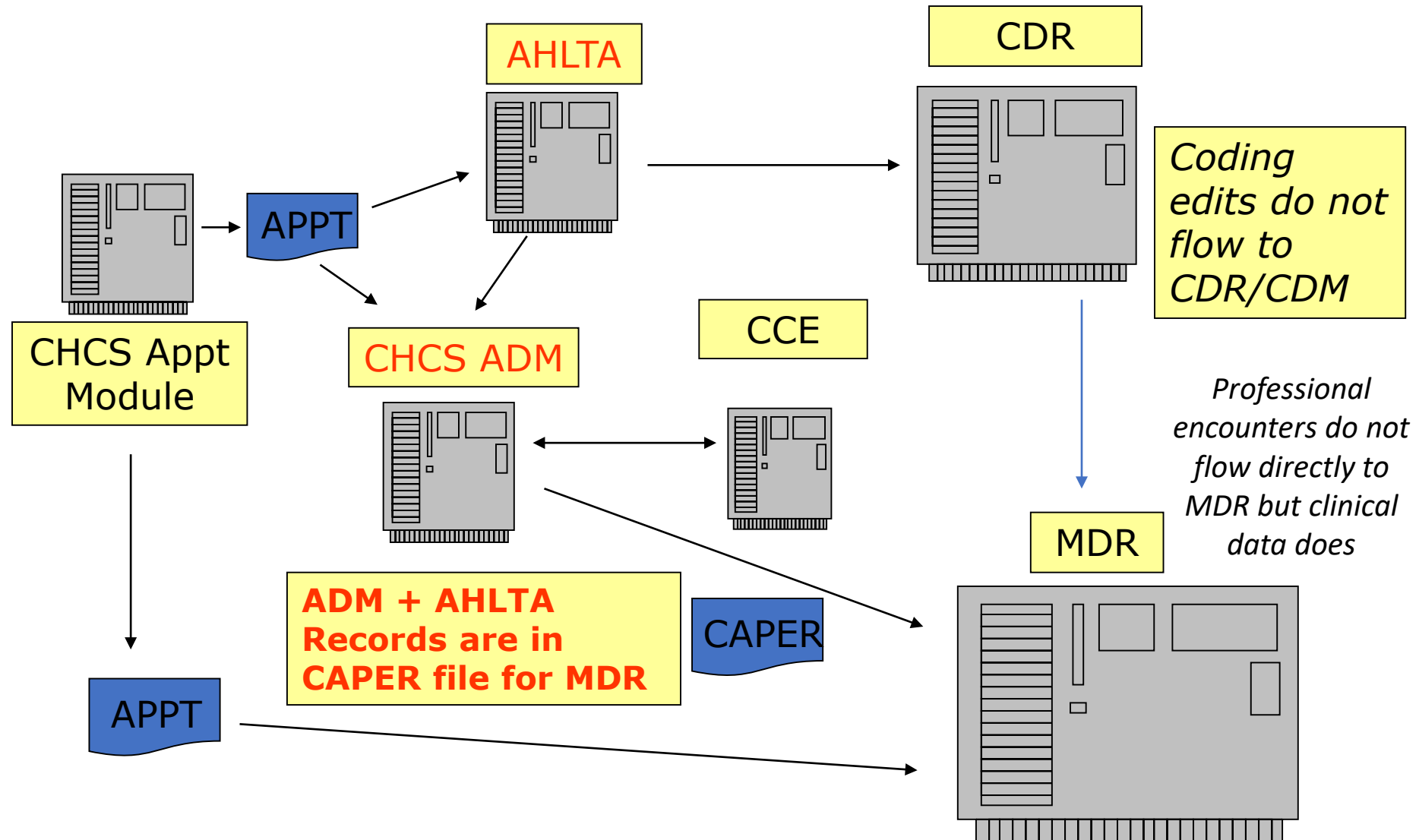
CHCS and AHLTA
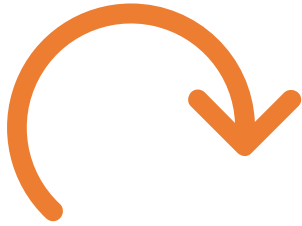
A write-back error occurs when AHLTA tries to send encounter information to CHCS ADM

Write-back errors result in lost workload, no RVU credit

Important enough that reporting of write-back error handling is an item on the DQ Statement (Item # B3a)
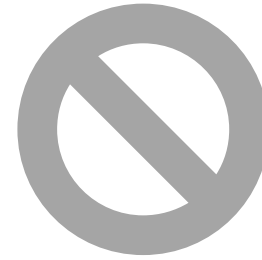
Write-back failures can occur if there are file differences between AHLTA and CHCS

Check provider tables, clinics they are assigned to, etc.

Check coding reference tables

Etc.

CHCS and Essentris
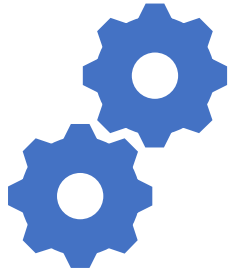
No write-back methodology was built for Essentris

Providers document the care they deliver but there is no automatic flow of that outside of Essentris; therefore:

Someone must code the doctor's notes with CPT/HCPCS and ICD Diagnoses

This is not uniformly happening for inpatient care and is a big deal! (More later)

Significant impacts on data completeness!

•Inpatient Studies, KSA Readiness Metric, Third Party Collections, MGMA Provider Efficiency Metric

Data flows between CHCS, AHLTA, DEERS and Essentris

DEERS

CHCS

Patient/Provider
Appointments
Ancillary Services

AHLTA

Eligibility Checks
Demographic Updates
PCM Assignments

Essentris

Coded Professional
Encounter Records

No communication back to other systems
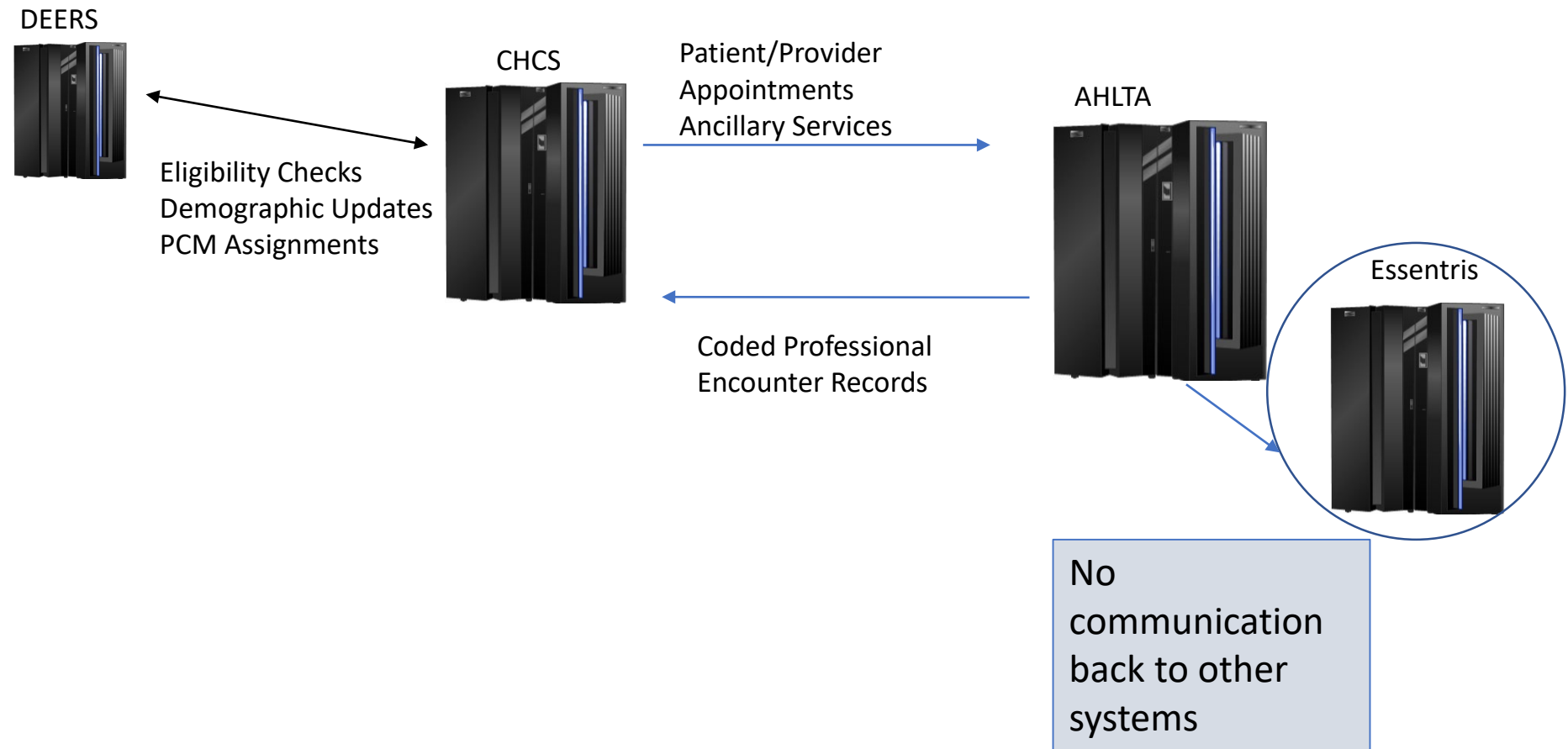
Data Products from CHCS

SINCE CHCS HOSTS ARE NOT CONNECTED, IT IS CRITICALLY IMPORTANT THAT DATA BE EXPORTED FROM CHCS AND STORED CENTRALLY

NECESSARY TO UNDERSTAND THE COMPLETE HEALTH HISTORY OF PATIENTS

THERE ARE MANY ROUTINE CHCS EXTRACTS, PRIMARILY GOING TO THE MHS DATA REPOSITORY (MDR), WHICH ARE THEN SENT THROUGH HSDW TO DAVINCI

DoD Source Data to DaVINCI

Data Flow and MDR Enhancements

Data Flow Summary

Operational DoD Sources

CHCS / AHLTA CDR

PDTS

DEERS

MDR
(Data Warehouse)

TRICARE claims

MHS GENESIS

Future webinar topics!!

and many more...

ETL

sas

M2
(Datamart)

Business Objects™

extracts

HSDW

TERADATA

extracts

DAVINCI
(SQL Database)

Microsoft®
SQL Server®
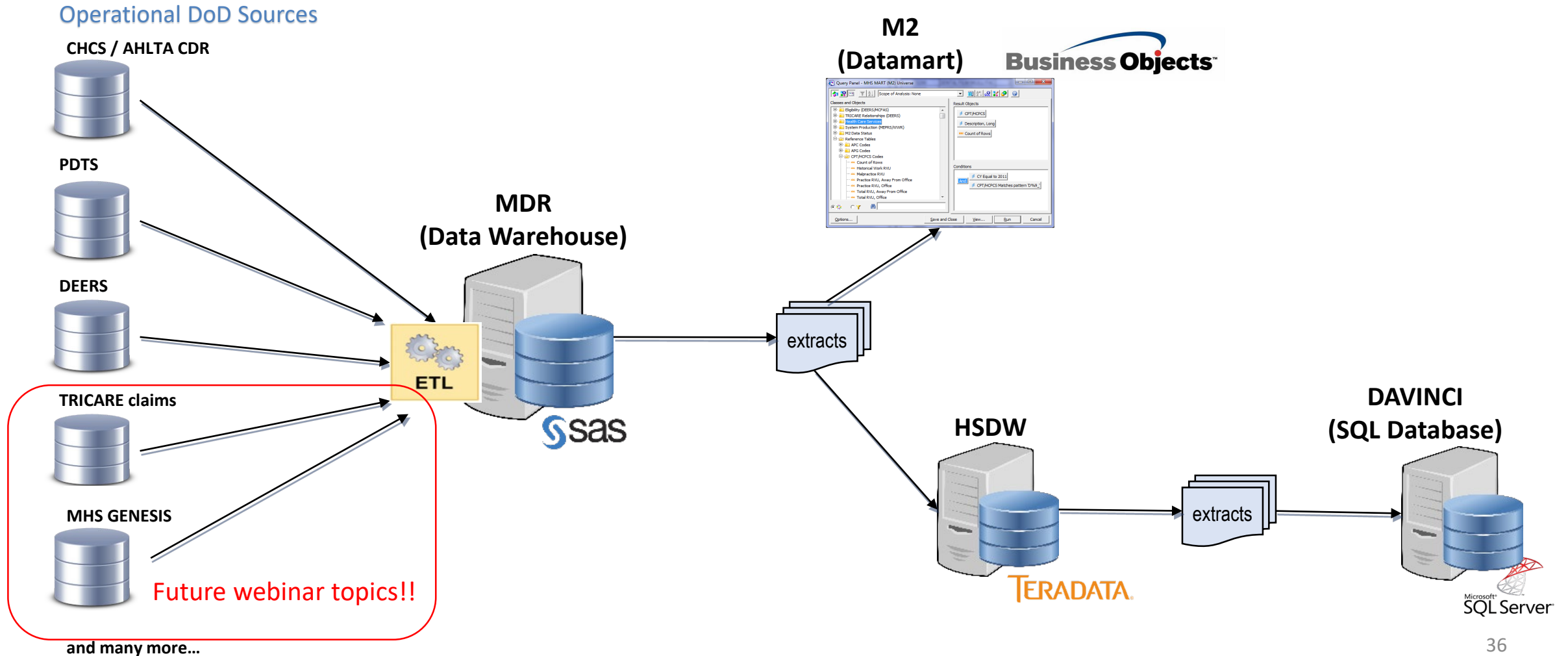
MDR Enhancements

Person Identification Enhancement

Master Person Index (MPI) used to track all known IDs and relationships for each person

If a person has multiple reasons for eligibility, MDR consistently assigns person ID no matter how they present for care

Application of DEERS Data across files ensures consistency!

Coding Edits

Units of Service

Groups diagnosis and procedure codes into categories

Diagnosis Related Groups (DRGs) (TRICARE Unique)

Major Diagnostic Categories (MDCs)

Ambulatory Payment Classifications (APCs)

AHRQ Clinical Classification Software

etc.

Many more!

DaVINCI

- Currently, 2 separate DaVINCI databases exist: one lives in a DoD analytic environment (HSDW – Teradata), and the other in the VA analytic environment (VINCI – SQL Server)

- Both contain the same OMOP CDM data tables

DaVINCI Infrastructure (current):

HSDW / MDR

Source

DaVINCI

DoD OMOP
VA OMOP

CDW / VINCI

DaVINCI

Source

DoD OMOP
VA OMOP

DHA

VHA
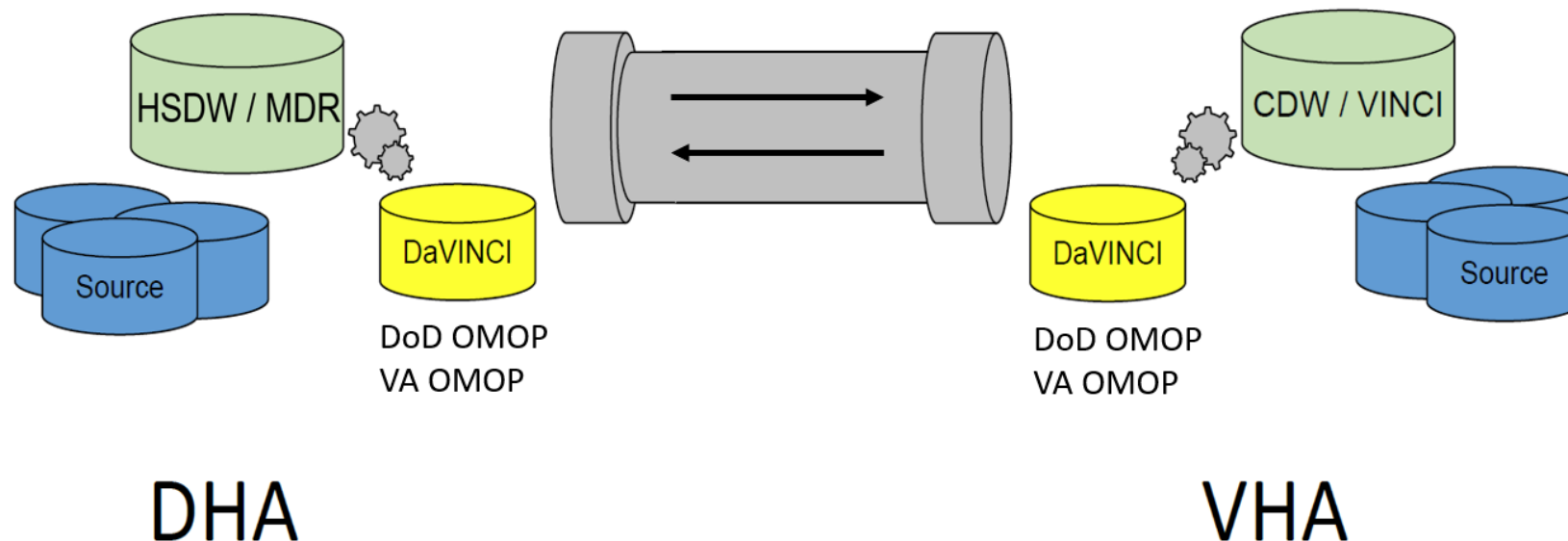
Current status: Data on VINCI RB02

DaVINCI 'Source' database
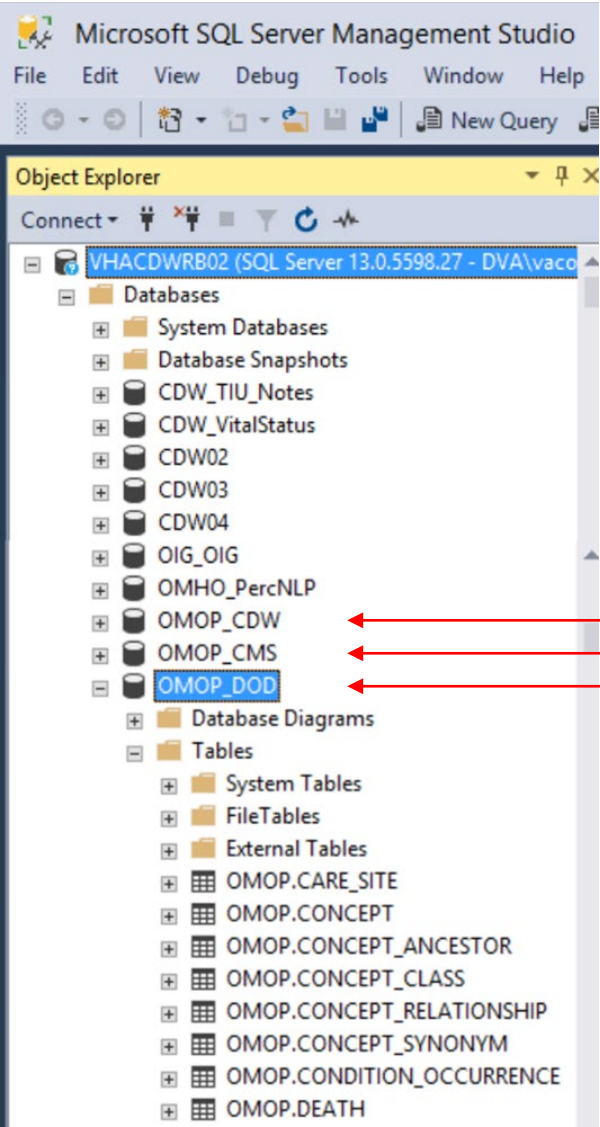
DoD OMOP, alongside CDW and CMS OMOPs
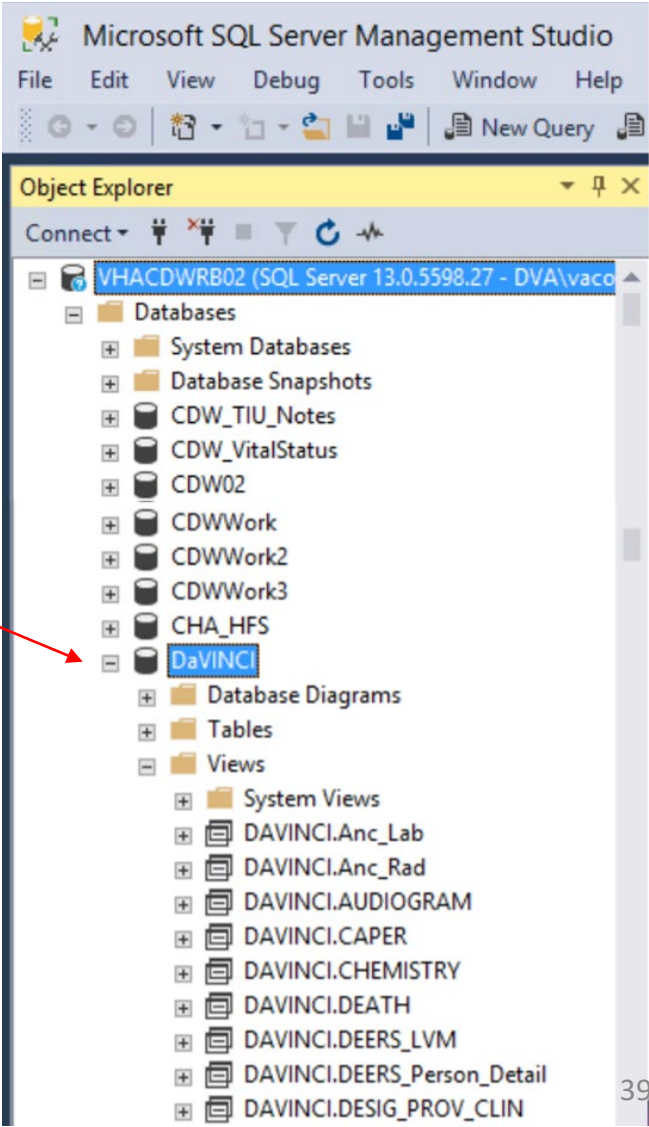
DoD Direct Care Tables

Summary of Source Tables

Direct Care Tables

Source	Name	Content
Standard Inpatient Data Record	SIDR	Inpatient Hospital
Comprehensive Prof Encounter Record	CAPER	Professional Services
Appointment	APPT	Appointments
Referral	REF	Referrals (MTF or Purchased Care)
Chemistry	Chem	Chemistry Exams & Results
Microbiology	Micro	Microbiology Exams & Susceptibility
Pathology	Path	Pathology Exams & Results
Radiology	Rad	Radiology Exams & Results
Schedulable Entity	SE	MTF Appointment Schedules
Pharmacy	RX	Dispensing Events
Subjective/Objective Notes	SO	Clinical Notes (AHLTA based only)
Immunizations	IMM	Immunization History
Vital Signs	Vitals	Vitals and Other questionnaire type data

Source Tables
DEERS
Master Death
SIDR
CAPER
TEDI
TEDN
PDTS
Ancillary
Designated Provider
TMDS
Vitals
Chemistry
Radiology
Microbiology, Pathology
Immunizations,
Medications

Person
Observation_period
Specimen
Death
Visit_occurrence
Procedure_occurrence
Drug_exposure
Device_exposure
Condition_occurrence
Measurement
Note
Observation
Fact_relationship

Standardized clinical data

Standardized health system data
Location
Care_site
Provider

Source Tables
DMIS ID
DMHRSi-HR
NPPES
TEDPR
Address

SIDR – Inpatient Care

- FY 89+
- Record: Represents the most recent version of a record for a patient dispositioned from an MTF
  - MTFs are acute care facilities
- Key Fields:
  - Dates: Admission Date & Disposition Date
  - Provider: Admitting & Attending
  - Clinical: TRICARE MS-DRG, Diagnosis and Procedures (ICD-9/10)

Inpatient Care

Medicare MS-DRG	MS-DRG Title	Weights
031	VENTRICULAR SHUNT PROCEDURES W MCC	4.3745
032	VENTRICULAR SHUNT PROCEDURES W CC	2.1921
033	VENTRICULAR SHUNT PROCEDURES W/O CC/MCC	1.7009
103	HEADACHES W/O MCC	0.7995
113	ORBITAL PROCEDURES W CC/MCC	2.1321

FY/CY	TRICARE MSDRG	Description	TRICARE Weight
2020	031	VENTRICULAR SHUNT PROCEDURES AGE >17 W MCC	4.3886
2020	032	VENTRICULAR SHUNT PROCEDURES AGE >17 W CC	1.9305
2020	033	VENTRICULAR SHUNT PROCEDURES AGE >17 W/O CC/MCC	1.7888
2020	104	CRANIOTOMY, VENTRICULAR SHUNT & ENDOVASC INTRACRANIAL PROC AGE 0-17	2.9161

- All Acute Care Stays are assigned a TRICARE MS-DRG – <u>different from Medicare's MS-DRG!</u>
  - TRICARE has a younger population than Medicare; therefore, the focus of care (as well as weights) will differ.

Medicare MS-DRG	MS-DRG Title	Weights
789	NEONATES, DIED OR TRANSFERRED TO ANOTHER ACUTE CARE FACILITY	1.6900
790	EXTREME IMMATURITY OR RESPIRATORY DISTRESS SYNDROME, NEONATE	5.5730
791	PREMATURITY W MAJOR PROBLEMS	3.8062
792	PREMATURITY W/O MAJOR PROBLEMS	2.2965
793	FULL TERM NEONATE W MAJOR PROBLEMS	3.9097
794	NEONATE W OTHER SIGNIFICANT PROBLEMS	1.3838

FY/CY	TRICARE MSDRG	Description	TRICARE Weight
2020	632	NEONATE, BIRTHWT 750-999G, DIED	7.4587
2020	633	NEONATE, BIRTHWT 1000-1499G, W SIGNIF O.R. PROC, DISCHARGED ALIVE	28.2557
2020	634	NEONATE, BIRTHWT 1000-1499G, W/O SIGNIF O.R. PROC, DISCHARGED ALIVE	10.0776
2020	635	NEONATE, BIRTHWT 1000-1499G, DIED	10.9705
2020	636	NEONATE, BIRTHWT 1500-1999G, W SIGNIF O.R. PROC, W MULT MAJOR PROB	31.4632
2020	646	NEONATE, BIRTHWT 1500-1999G, W SIGNIF O.R. PROC, W/O MULT MAJOR PROB	7.6167
2020	647	NEONATE, BIRTHWT 1500-1999G, W/O SIGNIF O.R. PROC, W MULT MAJOR PROB	7.2193
2020	648	NEONATE, BIRTHWT 1500-1999G, W/O SIGNIF O.R. PROC, W MAJOR PROB	4.0931
2020	649	NEONATE, BIRTHWT 1500-1999G, W/O SIGNIF O.R. PROC, W MINOR PROB	3.8363
2020	650	NEONATE, BIRTHWT 1500-1999G, W/O SIGNIF O.R. PROC, W OTHER PROB	2.7126
2020	651	NEONATE, BIRTHWT 2000-2499G, W SIGNIF O.R. PROC, W MULT MAJOR PROB	10.3052

SIDR – Inpatient Care

Top MS-DRGs

FY	MS-DRG	MS-DRG Description	Dispositions
2019	795	NORMAL NEWBORN	22,377
2019	807	VAGINAL DELIVERY W/O STERILIZATION/D&C W/O CC/MCC	20,168
2019	792	NEONATE, BIRTHWT >2499G, W/O SIGNIF O.R. PROC, W OTHER PROB	11,970
2019	773	CESAREAN SECTION W/O STERILIZATION W/O CC/MCC	4,962
2019	806	VAGINAL DELIVERY W/O STERILIZATION/D&C W CC	4,805
2019	882	NEUROSES EXCEPT DEPRESSIVE	4,713
2019	951	OTHER FACTORS INFLUENCING HEALTH STATUS	4,267
2019	392	ESOPHAGITIS, GASTROENTERITIS & MISCELLANEOUS DIGESTIVE DS A(	3,229
2019	881	DEPRESSIVE NEUROSES	3,224
2019	470	MAJOR HIP & KNEE JOINT REPLACEMENT OR REATTACHMENT OF LOW	3,143
2019	743	UTERINE & ADNEXA PROCEDURES FOR NON-MALIGNANCY W/O CC/MCC	2,838
2019	885	PSYCHOSES	2,646
2019	313	CHEST PAIN	2,574

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SIDR – Inpatient Care

- Includes observation stays coded as an admission (see Observation Flag: Based on Diagnosis 1 V719/Z049 and Bed Days <= 2)

FY	Observation Stay Flag	Dispositions	Percentage:
2019	N	209,277	98.30%
2019	Y	3,611	1.70%

SADR/CAPER – Professional Services

- SADR (FY98 – FY04*) & CAPER (FY 04+)
- Record: Each record represents an encounter or an administrative record
- The "Comprehensive Professional Encounter Record" includes:
  - Ambulatory Professional Services
    - Office Visits, Emergency Department, Same Day Surgery
    - Covers Lab/Rad done in Clinic (e.g., Rapid STREP Tests)
    - Covers certain physician administered medications ("J codes") which are administered at the clinic
  - Inpatient Professional Services
  - Administrative Records
    - Referral Tracking, Clear and Legible reports

FY	MEPRS1 Code Description	Encounters
2019	Outpatient	37,041,413
2019	Special Programs	2,415,131
2019	Inpatient	781,809
2019	Support Services	525,746
2019	Ancillary	34,981
2019	Dental	12,982

DoD EHR Administrative Encounters

- Increasing use of administrative diagnosis codes (ICD-10: Z0289/Z029 Encounter for Other/Unspecified Administrative Examinations ; ICD-9: V689 Unspecified Administrative Purpose)

- These represent referral tracking encounters.

- When MTFs make referrals to the private sector, the purchased care provider must send a report on the first visit that results from the referral.

- These "encounter records" indicate that the MTF needs a clear and legible report for the patient.

- These records do not represent care delivery.

Number of V68.9/Z02.89/Z02.9 CAPERs

Year	Value
2014	3,077,184
2015	3,586,628
2016	5,305,344
2017	5,299,935
2018	4,853,311
2019	4,823,676
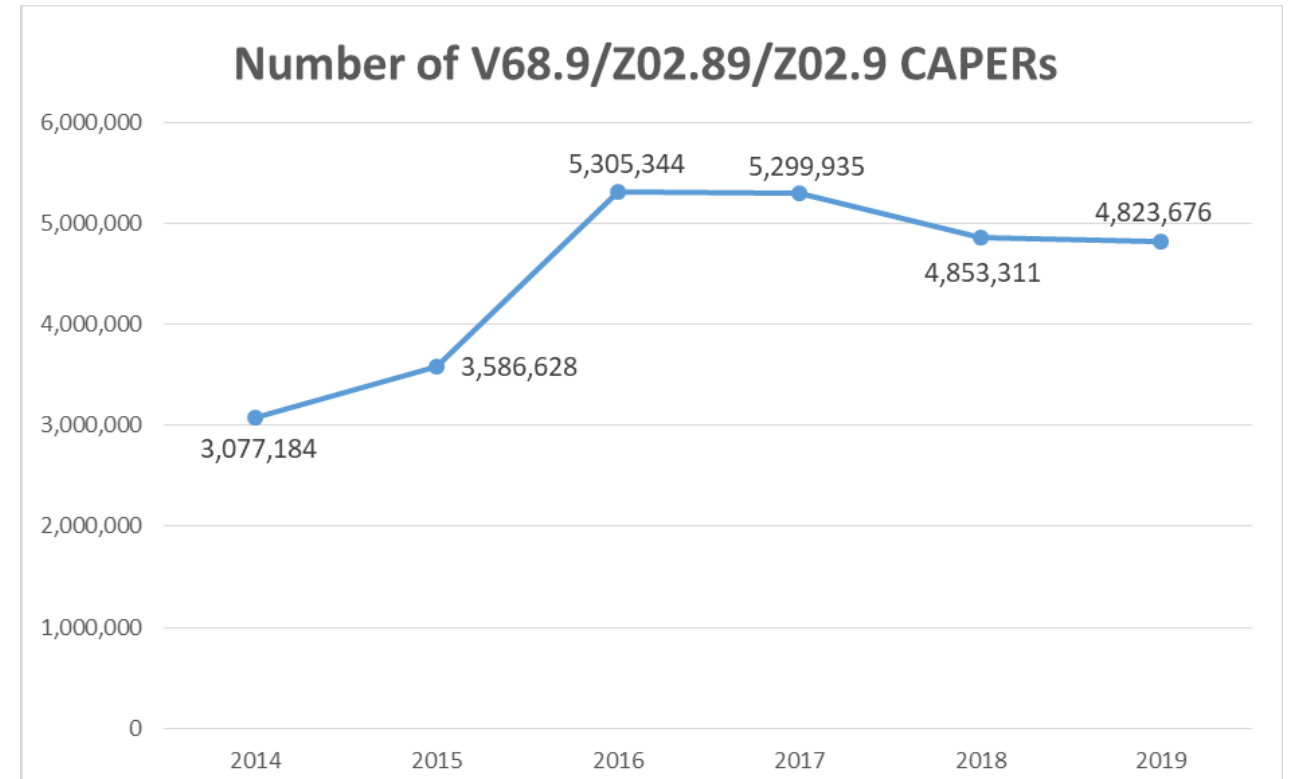
SADR/CAPER – Professional Services

- Record: Each record represents an encounter or an administrative record

- Each Encounter has up to 3 Providers that can link to 13 Procedures
  - The linkage is not yet available in DaVINCI, but is available in the MDR

- Key Fields:
  - Date: Encounter Date
  - Location: Treatment DMIS ID, MEPRS Code ("clinic")
  - Provider: Provider Identifiers, Specialty, etc.
  - Clinical Information: Diagnosis (ICD-9/10) & Procedure Codes (CPT/HCPCs)

Lab & Radiology

- FY 05+

- Record: Represents a lab or radiology component

- Labs
  - Most labs are captured on one record (e.g., with CPT)

- Radiology
  - Radiology are recorded with a technical (TC) and professional (26) component through the CPT Modifier
    - Two separate records!

Pharmacy - PDTS

FY 2019
Dispensing Source

- FY 02+

- Record: Dispensed Medication (outpatient)

- Key Fields:
  - Date: Date Dispensed
  - Ordering Information: Ordering Appointment, Provider, etc.
  - Clinical: National Drug Code, GCN, Therapeutic Class
  - Pharmacy Dispensing Source:
    - Direct Care (MTF) Pharmacy
    - Clinician Administered
    - *Retail Pharmacy*
    - *Mail Order (TMOP)*
    - *Line Unit (FY 2011+)*
    - *VA (FY 2006+)*
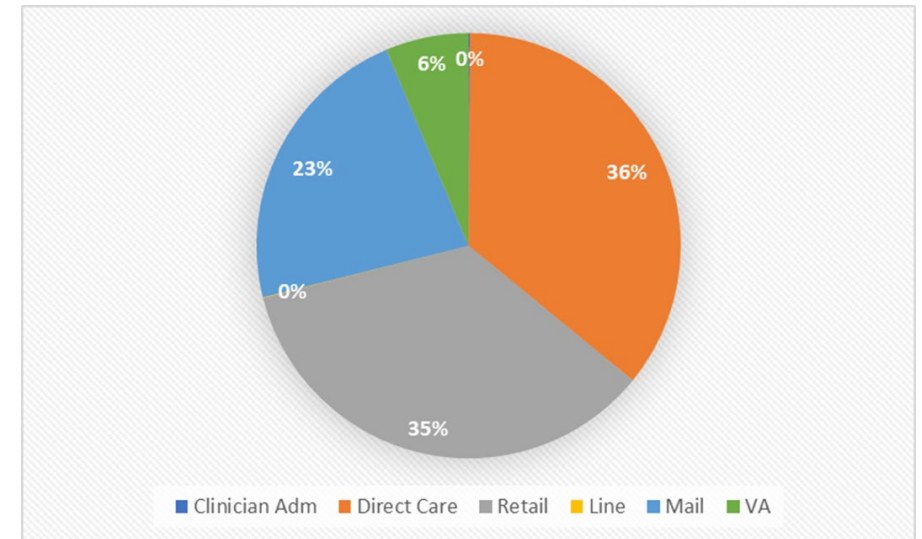
Clinical Tables (FY 09+)

- Vitals
  - Key Fields: Blood Pressure, Height, Weight, BMI, Tobacco, Alcohol Use, Pain
- Immunizations (Administered and Self-Reported)
  - Key Fields: CVX
- Lab Results (LOINC)
  - Chemistry
  - Microbiology
  - Pathology
- Radiology Results

DoD Direct Care
Summary of Key Tables

SIDR

CAPER

TMDS
(Theater Data)

CDR
Medications

Lab &
Rad

Outpatient
Rx

Vitals
Immunizations

Radiology Results
Microbiology Results
Chemistry Results
Pathology Results
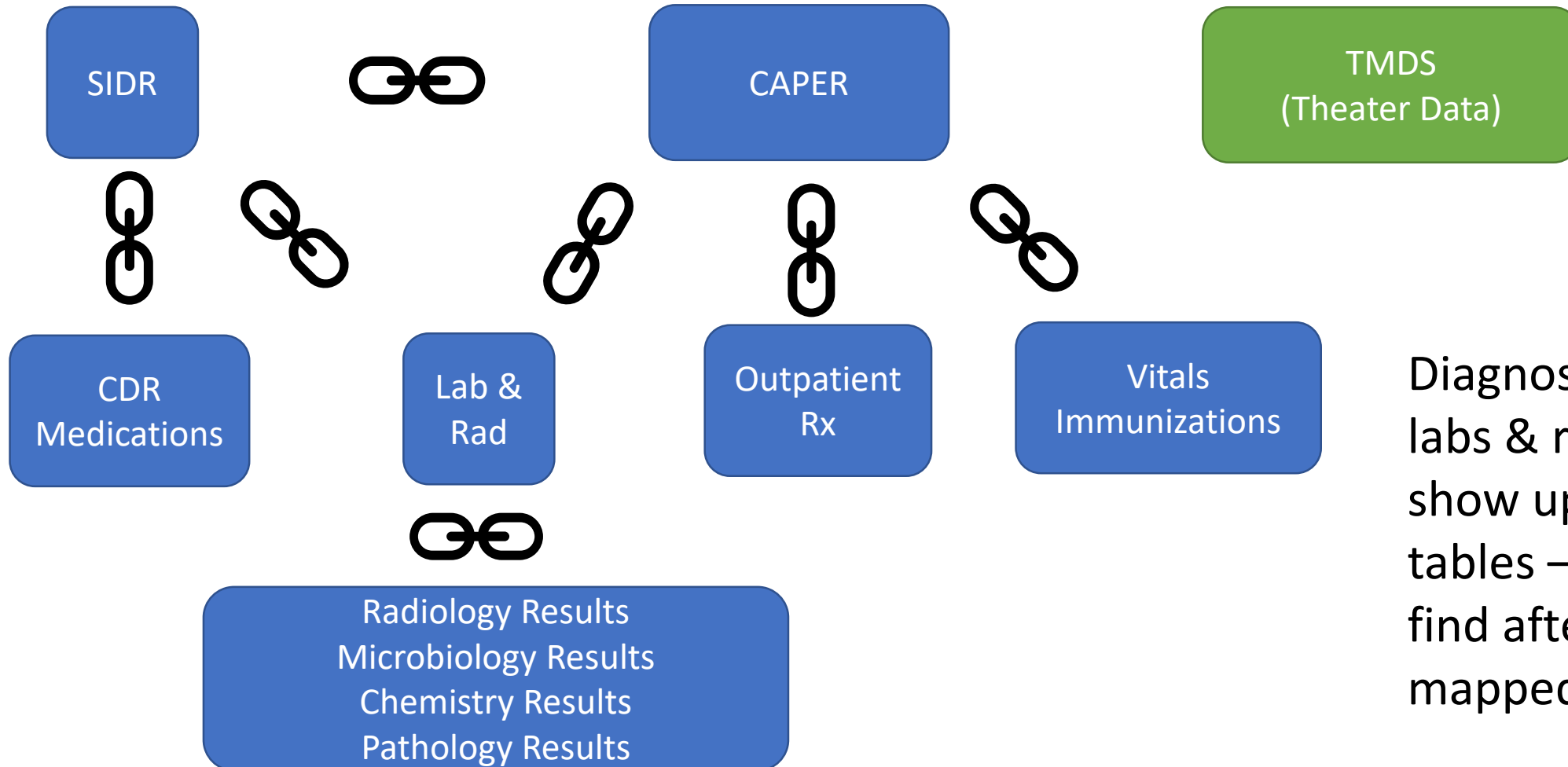
Diagnoses, Procedures, labs & rads, medications show up across multiple tables – much easier to find after they are mapped to OMOP!

DoD EHR Data in OMOP

OMOP Tables

DoD OMOP Visit_occurrence Table

visit_occurrence
🔑 visit_occurrence_id
⭐ person_id
❑ visit_concept_id
❑ visit_start_date
❑ visit_start_datetime
❑ visit_end_date
❑ visit_end_datetime
❑ visit_type_concept_id
⭐ provider_id
⭐ care_site_id
❑ visit_source_value
❑ visit_source_concept_id
❑ admitting_source_concept_id
❑ admitting_source_value
❑ discharge_to_concept_id
❑ discharge_to_source_value
❑ preceding_visit_occurrence_id

- The DoD OMOP Visit_occurrence table has encounters from inpatient and outpatient data, direct care and purchased care

- MDR/HSDW Source tables:

  - SIDR (direct care inpatient)

  - CAPER/SADR (direct care outpatient)

  - TEDI (purchased care inpatient)

  - TEDNI (purchased care outpatient)

  - Designated Provider (Clinical)

  - TMDS Encounters (theater encounters)

DoD OMOP Condition_occurrence Table

condition_occurrence	
🔑	condition_occurrence_id
⭐	person_id
❑	condition_concept_id
❑	condition_start_date
❑	condition_start_datetime
❑	condition_end_date
❑	condition_end_datetime
❑	condition_type_concept_id
❑	stop_reason
⭐	provider_id
⭐	visit_occurrence_id
❑	condition_source_value
❑	condition_source_concept_id
❑	condition_status_source_value
❑	condition_status_concept_id

- Rows for the Condition_occurrence table can come from many sources and many fields:

Source	Source Fields	Source Vocabularies
SIDR	Diagnosis 1-20; Diagnosis, Admitting	ICD9CM, ICD10CM
CAPER	Diagnosis 1-10; Diagnosis, Chief Complaint	ICD9CM, ICD10CM
TEDI	Diagnosis 1-12; Admission Diagnosis	ICD9CM, ICD10CM
TEDN	Diagnosis 1-5	ICD9CM, ICD10CM
Designated Provider	PDX, DX2-12, SVCDX1-6	ICD9CM, ICD10CM
TMDS Encounters	DX1-20, DXMOD1-5	ICD9CM, ICD10CM

- All concepts map to SNOMED as the standard concept vocabulary

- Very useful tool for building cohorts based on condition or disease status

Top Conditions in DoD OMOP

```sql
SELECT cond.[condition_concept_id], concept.concept_name, concept.vocabulary_id, count(*) as freq
    FROM [DoD_OMOP].[OMOP].[CONDITION_OCCURRENCE] cond
    LEFT JOIN [DoD_OMOP].[OMOP].[CONCEPT] concept
    ON cond.condition_concept_id = concept.concept_id
    GROUP BY cond.condition_concept_id, concept.concept_name, concept.vocabulary_id
    ORDER BY 4 desc
```

	condition_concept_id	concept_name	vocabulary_id	freq
1	0	No matching concept	None	66507703
2	320128	Essential hypertension	SNOMED	55055196
3	194133	Low back pain	SNOMED	35584186
4	432867	Hyperlipidemia	SNOMED	31809062
5	201826	Type 2 diabetes mellitus	SNOMED	30508181
6	442588	Obstructive sleep apnea syndrome	SNOMED	20831462
7	78232	Shoulder joint pain	SNOMED	19803778
8	312648	Benign essential hypertension	SNOMED	17522298
9	255573	Chronic obstructive lung disease	SNOMED	17243171
10	77670	Chest pain	SNOMED	16539844
11	313217	Atrial fibrillation	SNOMED	15653751
12	444094	Finding related to pregnancy	SNOMED	13177753
13	24134	Neck pain	SNOMED	12176794
14	138525	Pain in limb	SNOMED	12131869
15	257007	Allergic rhinitis	SNOMED	11820720
16	42872402	Coronary arteriosclerosis in native artery	SNOMED	10642197
17	257011	Acute upper respiratory infection	SNOMED	10241898
18	437827	Pure hypercholesterolemia	SNOMED	9795490
19	200219	Abdominal pain	SNOMED	9776771

- Lots of unmapped codes (4%)

- Essential hypertension maps from ICD9 401.9 and ICD10 I10

- Low back pain maps from ICD9 724.2 and ICD10 M54.5

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Top Procedures in DoD OMOP

```sql
SELECT procs.[PROCEDURE_CONCEPT_ID], concept.concept_name, concept.vocabulary_id, count(*) as freq
  FROM [DoD_OMOP].[OMOP].[PROCEDURE_OCCURRENCE] procs
  LEFT JOIN [DoD_OMOP].[OMOP].[CONCEPT] concept
  ON procs.procedure_concept_id = concept.concept_id
  GROUP BY procs.procedure_concept_id, concept.concept_name, concept.vocabulary_id
  ORDER BY 4 desc
```

	PROCEDURE_CONCEPT_ID	concept_name	vocabulary_id	freq
1	2514573	Unlisted evaluation and management service	CPT4	184267800
2	2414397	Office or other outpatient visit for the evaluation and ...	CPT4	124356324
3	2414398	Office or other outpatient visit for the evaluation and ...	CPT4	86224738
4	4065062	Health examination of sub-group	SNOMED	80359435
5	2314284	Therapeutic procedure, 1 or more areas, each 15 mi...	CPT4	60931029
6	2414396	Office or other outpatient visit for the evaluation and ...	CPT4	33057268
7	2314290	Manual therapy techniques (eg, mobilization/ manipu...	CPT4	26831578
8	2108115	Collection of venous blood by venipuncture	CPT4	25935566
9	4254477	Counseling	SNOMED	25438535
10	2211361	Radiologic examination, chest, 2 views, frontal and l...	CPT4	23802211
11	0	No matching concept	None	22198248
12	2514408	Subsequent hospital care, per day, for the evaluation...	CPT4	20508579
13	2414395	Office or other outpatient visit for the evaluation and ...	CPT4	20129493
14	2514548	Telephone evaluation and management service by a...	CPT4	19790550
15	2213418	Immunization administration (includes percutaneous, i...	CPT4	18719834
16	2414392	Office or other outpatient visit for the evaluation and ...	CPT4	14509894
17	2213283	Level IV - Surgical pathology, gross and microscopic ...	CPT4	13365947
18	2313637	Determination of refractive state	CPT4	12979546
19	2314285	Therapeutic procedure, 1 or more areas, each 15 mi...	CPT4	12844514

- Better overall mapping (concept_id = 0 is only #11)

- First several CPT codes are: 99499, 99213, 99214, 97110 (E&M and PT codes)

- Health examination of sub-group is mapped from diagnosis codes (ICD9 = V70.5, ICD10 = Z00.6, Z10.8)

  - V70.5 was used to capture health assessment forms (PDHA, PDHRA, etc.)

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DoD OMOP Procedure_occurrence Table

procedure_occurrence

🔑	procedure_occurrence_id
⭐	person_id
❑	procedure_concept_id
❑	procedure_date
❑	procedure_datetime
❑	procedure_type_concept_id
❑	modifier_concept_id
❑	quantity
⭐	provider_id
⭐	visit_occurrence_id
❑	procedure_source_value
❑	procedure_source_concept_id
❑	qualifier_source_value

- Rows for the Procedure_occurrence table can come from many sources and many fields:

Source	Procedure Fields	Procedure Vocabularies	Diagnosis Fields	Diagnosis Vocabularies
SIDR	Procedure 1-20	ICD9Proc, ICD10PCS	Diagnosis 1-20; Diagnosis, Admitting	ICD9CM, ICD10CM
CAPER	E&M Code 1-3, Procedure 1-10	CPT4, HCPCS	Diagnosis 1-10; Diagnosis, Chief Complaint	ICD9CM, ICD10CM
TEDI	Procedure 1-6	ICD9Proc, ICD10PCS	Diagnosis 1-12; Admission Diagnosis	ICD9CM, ICD10CM
TEDN	Procedure Code	CPT4, HCPCS	Diagnosis 1-5	ICD9CM, ICD10CM
Ancillary	Procedure Code	CPT4, HCPCS		
Designated Provider	SVCPROC1-6, HOSPPRCP, HOSPPRC2-6	CPT4, HCPCS, ICD9Proc, ICD10PCS	PDX, DX2-12, SVCDX1-6	ICD9CM, ICD10CM
TMDS Encounters	CPT1, EM_CODE	CPT4, HCPCS	DX1-20, DXMOD1-5	ICD9CM, ICD10CM

- Notice that diagnosis codes can map to the procedure domain as well. **Take caution not to double count in this file!**

DoD OMOP Drug_exposure Table

drug_exposure
🔑 drug_exposure_id
⭐ person_id
❑ drug_concept_id
❑ drug_exposure_start_date
❑ drug_exposure_start_datetime
❑ device_exposure_end_date
❑ drug_exposure_end_datetime
❑ verbatim_end_date
❑ drug_type_concept_id
❑ stop_reason
❑ refills
❑ quantity
❑ days_supply
❑ sig
❑ route_concept_id
❑ lot_number
⭐ provider_id
⭐ visit_occurrence_id
❑ drug_source_value
❑ drug_source_concept_id
❑ route_source_value
❑ dose_unit_source_value

- Rows for the Drug_exposure table can come from many sources and many fields including drug-specific sources and other sources by CPT/HCPCS:

Source	Source Fields	Source Vocabularies
PDTS	NDC	NDC
CDR Medications	NDC	NDC
Designated Provider (Pharmacy)	NDC	NDC
CDR Immunizations	IMMUNIZATION_ID	CVX
GENESIS Immunizations	CVX	CVX
CAPER	E&M Code 1-3, Procedure 1-10	CPT4, HCPCS
TEDNI	Procedure Code	CPT4, HCPCS
Designated Provider (Clinical)	SVCPROC1-6, HOSPPRCP, HOSPPRC2-6	CPT4, HCPCS
Ancillary	Procedure Code	CPT4, HCPCS
TMDS Encounters	CPT1, EM_CODE	CPT4, HCPCS

- Concepts map to either RxNorm or CVX as standard concept vocabularies

- Use in combination with the Drug_strength vocabulary table to analyze data by dosage

Top Drugs in DoD OMOP

```sql
SELECT drug.[DRUG_CONCEPT_ID], concept.concept_name, concept.vocabulary_id, count(*) as freq
    FROM [DoD_OMOP].[OMOP].[DRUG_EXPOSURE] drug
    LEFT JOIN [DoD_OMOP].[OMOP].[CONCEPT] concept
    ON drug.drug_concept_id = concept.concept_id
    GROUP BY drug.drug_concept_id, concept.concept_name, concept.vocabulary_id
    ORDER BY 4 desc
```

	DRUG_CONCEPT_ID	concept_name	vocabulary_id	freq
1	19019074	Ibuprofen 800 MG Oral Tablet	RxNorm	15463025
2	40213268	anthrax vaccine	CVX	12145431
3	19019418	Omeprazole 20 MG Delayed Release Oral Capsule	RxNorm	10732105
4	40213149	influenza virus vaccine, live, attenuated, for intranasal ...	CVX	9926302
5	19123106	Esomeprazole 40 MG Delayed Release Oral Capsule [...	RxNorm	9526294
6	19078106	Hydrochlorothiazide 25 MG Oral Tablet	RxNorm	9144210
7	40213246	typhoid Vi capsular polysaccharide vaccine	CVX	8859249
8	40213156	influenza virus vaccine, split virus (incl. purified surface ...	CVX	8412044
9	19019273	Naproxen 500 MG Oral Tablet	RxNorm	7926322
10	19134047	tramadol hydrochloride 50 MG Oral Tablet	RxNorm	7801608
11	1539407	Simvastatin 40 MG Oral Tablet	RxNorm	7542424
12	40213306	hepatitis B vaccine, adult dosage	CVX	7355299
13	40231925	Acetaminophen 325 MG / Oxycodone Hydrochloride 5 ...	RxNorm	7226968
14	40213296	hepatitis A vaccine, adult dosage	CVX	7089344
15	40213303	hepatitis A and hepatitis B vaccine	CVX	7031212
16	1539411	Simvastatin 20 MG Oral Tablet	RxNorm	7026371
17	19080129	Lisinopril 20 MG Oral Tablet	RxNorm	6949029
18	40213183	measles, mumps and rubella virus vaccine	CVX	6786662
19	778765	Cyclobenzaprine hydrochloride 10 MG Oral Tablet	RxNorm	6649380

- RxNorm is mostly mapped from NDC codes (pharmacy)

- CVX are immunization codes

DoD OMOP Measurement Table

measurement	
🔑	measurement_id
⭐	person_id
❑	measurement_concept_id
❑	measurement_date
❑	measurement_datetime
❑	measurement_type_concept_id
❑	operator_concept_id
❑	value_as_number
❑	value_as_concept_id
❑	unit_concept_id
❑	range_low
❑	range_high
⭐	provider_id
⭐	visit_occurrence_id
❑	measurement_source_value
❑	measurment_source_concept
❑	unit_source_value
❑	value_source_value

- Rows for the Measurement table primarily come from Chemistry Lab Results and Vitals data, but can also come from other sources, especially Lab CPT codes

  - Chemistry and Vitals come from the CDR and are only available from FY09+

- Chemistry results are in the LOINC vocabulary which is fairly well populated on DoD data (~92%), although early tests of data from MHS GENESIS show big gaps

- Categorical results from Chemistry (e.g. Positive, Negative, Normal, etc.) have not yet been mapped to concept_ids

- Vitals data is mapped using a custom mapping based on the data that is captured:

Source Field	OMOP Concept ID	Unit Concept ID
SYSTOLIC_SIT	3034703	8876 (mm Hg)
SYSTOLIC_STAND	3019962	8876
DIASTOLIC_SIT	3018586	8876
RATE_SIT	40771525	8483 (/min)
HEIGHT_INCHES	3023540	9330 (inch)
RESPIRATORY_RATE	3024171	8483
TEMPERATURE_F (w/ TEMP_SITE_ID = E)	21490907	9289 (degree Fahrenheit)
WEIGHT_LBS	3013762	8739 (pound)

Top Measurements in DoD OMOP

```sql
SELECT meas.[MEASUREMENT_CONCEPT_ID], concept.concept_name, concept.vocabulary_id, count(*) as freq
  FROM [DoD_OMOP].[OMOP].[MEASUREMENT] meas
  LEFT JOIN [DoD_OMOP].[OMOP].[CONCEPT] concept
  ON meas.measurement_concept_id = concept.concept_id
  GROUP BY meas.measurement_concept_id, concept.concept_name, concept.vocabulary_id
  ORDER BY 4 desc
```

	MEASUREMENT_CONCEPT_ID	concept_name	vocabulary_id	freq
1	3034703	Diastolic blood pressure--sitting	LOINC	96892872
2	3018586	Systolic blood pressure--sitting	LOINC	96886280
3	40771525	Heart rate --sitting	LOINC	94050926
4	3013762	Body weight Measured	LOINC	92678399
5	3023540	Body height Measured	LOINC	90421141
6	3024171	Respiratory rate	LOINC	78036323
7	3020891	Body temperature	LOINC	68437831
8	40762508	Oxygen saturation in Arterial blood by Pulse oximetr...	LOINC	46836843
9	2212648	Blood count; complete (CBC), automated (Hgb, Hct...	CPT4	33489496
10	2212093	Comprehensive metabolic panel This panel must in...	CPT4	20242734
11	2212095	Lipid panel This panel must include the following: C...	CPT4	19675863
12	3004501	Glucose lab	LOINC	17485189
13	2212884	Antibody; HIV-1 and HIV-2, single result	CPT4	16483905
14	3000963	Hemoglobin	LOINC	16468955
15	3023314	Hematocrit [Volume Fraction] of Blood by Automate...	LOINC	16325315
16	3020416	Erythrocytes [#/volume] in Blood by Automated co...	LOINC	15831890
17	3023599	MCV [Entitic volume] by Automated count	LOINC	15797708
18	3009744	MCHC [Mass/volume] by Automated count	LOINC	15753522
19	3012030	MCH [Entitic mass] by Automated count	LOINC	15751721

From CDR Vitals

Lab Orders (by CPT Code)

Lab Chemistry Results (by LOINC)

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DoD OMOP Note Table

note	
🔑	note_id
⭐	person_id
❑	note_date
❑	note_datetime
❑	note_type_concept_id
❑	note_class_concept_id
❑	note_title
❑	note_text
❑	encoding_concept_id
❑	language_concept_id
⭐	provider_id
❑	note_source_value
⭐	visit_occurrence_id

- The Note table stores free-text fields

- Difficult to parse data in an automated fashion without Natural Language Processing (NLP) software and expertise

- Lots of rich clinical data is available in this table

- Note_type_concept_id:

  - 44814641 = Radiology report (32.7M rows)

  - 44814643 = Ancillary report (7.6M rows, used for Microbiology)

  - 44814642 = Pathology report (3.5M rows)

DoD OMOP Observation Table

observation

- 🔑 observation_id
- ⭐ person_id
- ❑ observation_concept_
- ❑ observation_date
- ❑ observation_datetime
- ❑ observation_type_cor
- ❑ value_as_number
- ❑ value_as_string
- ❑ value_as_concept_id
- ❑ qualifier_concept_id
- ❑ unit_concept_id
- ⭐ provider_id
- ⭐ visit_occurrence_id
- ❑ observation_source_value
- ❑ observation_soure_concept_id
- ❑ unit_source_value
- ❑ qualifier_source_value

Top Observations in DoD OMOP (sort of a grab bag)

	OBSERVATION_CONCEPT_ID	concept_name	vocabulary_id	freq
1	38001648	Musculoskeletal System & Connective Tissue	MDC	272376317
2	38001663	Factors Influencing Hlth Stat & Other Contacts wi…	MDC	262861792
3	38001645	Circulatory System	MDC	147881393
4	38001643	Ear, Nose, Mouth & Throat	MDC	94112482
5	4022240	Pain score	SNOMED	89768767
6	38001649	Skin, Subcutaneous Tissue & Breast	MDC	85484019
7	4005823	Tobacco user	SNOMED	84684871
8	0	No matching concept	None	82515845
9	38001644	Respiratory System	MDC	82176283
10	4062656	Alcohol consumption screening	SNOMED	81134491
11	38001650	Endocrine, Nutritional & Metabolic Diseases & Di…	MDC	74437553
12	38001646	Digestive System	MDC	72576884
13	38001651	Kidney & Urinary Tract	MDC	62688349
14	38001641	Nervous System	MDC	60153732
15	441482	Administrative reason for encounter	SNOMED	58477099

Lots of MDCs

From CDR Vitals

From Diagnosis Codes

DRGs, MSDRGs, and APCs will also appear in this table

Summary

- We have covered:
  - ✓ Describe the sources, processing flow, and completion lag of DoD EHR data and DEERS and where they interact
  - ✓ Provide an overview of the main direct care files and how they interact to build episodes of care
  - ✓ Describe limitations of inpatient professional coding and potential impacts on studies
  - ✓ Describe non-clinical encounters in direct care data and what information they capture and how it relates to OMOP

Useful Links: DaVINCI Documentation

- VINCI Central: Data Sources

  - DaVINCI Data Dictionary, DoD Mapping Design, and OMOP ETL Specification are posted

    https://vaww.vinci.med.va.gov/VinciCentral/DataSources/Index

- DaVINCI Data Academy

  - Also includes DaVINCI Data Dictionary, DoD Mapping Design, and OMOP ETL as well as data training

    https://sps.vinci.med.va.gov/prod/vincipedia/Pages/DaVINCI-Data-Academy.aspx

Questions?