

Understanding Cost Variables in DoD DaVINCI Databases

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Focusing Question

- What are the cost variables available in DoD DaVINCI data?
- How can they be used and compared with VA cost variables?

Objectives

1. To describe the cost variables in DoD DaVINCI databases.
2. To explain how they can be compared with VA using an example for hospitalizations.

Perspective

- Perspective



VA researchers



DoD researchers

POLL

- Have you had the opportunity to use any DoD DaVINCI data?
- Yes, including cost
- Yes, but not including cost
- No, I have not used any DoD DaVINCI data.

Outline

1. General overview of DoD Databases
2. Presenting the 4 DoD DaVINCI databases containing cost variables
3. Give an example for comparing hospitalization costs between DoD and VA
4. Explaining challenges for comparing outpatient costs between DoD and VA

General overview of DoD Databases

Military Health System

- The Military Health System (MHS) includes both direct care and purchased care.
- Direct care is care provided in hospitals and clinics operated by MHS (Military Medical Treatment Facilities or MTFs).
- Stateside, this data is referred to as MTF data; when service members receive direct care abroad, it is referred to as Theatre data.
- Theatre data is available in DaVINCI databases but does not include costs.

Tricare Databases

- Most beneficiaries also have supplemental insurance through MHS to receive care in the private sector, called Tricare.
- Tricare data reflects claims private sector providers submit to MHS to be reimbursed for care.
- Tricare accounts for a larger portion of utilization and expenditures than direct care: in FY21, Tricare utilization was approximately double that of direct care utilization.¹
- *Detailed electronic medical record information is available for MTF care (direct care). Only claims data is available for care received through Tricare (purchased care).*

1. <https://www.health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/Health-Care-Program-Evaluation/Annual-Evaluation-of-the-TRICARE-Program>

Who is included in DaVINCI records?

- DaVINCI databases include records for Veterans and active-duty military.
- There is not a clear line separating MHS care use (MTF care and Tricare) and VA care.
- Patients may go back and forth between systems.
- For example, active-duty individuals with traumatic brain injury (TBI) may use VA's polytrauma rehab centers. Once individuals separate from DoD, they may use Tricare in combination with VA.

Overview of DaVINCI Data

- DaVINCI data contain comprehensive clinical, demographic, beneficiary, cost, and service-related information for all active-duty military. DaVINCI databases contain a unique identifier researchers can use to link across data sources.
- DaVINCI includes datasets familiar to VA researchers, albeit with a different name, including
 - Outpatient utilization (CAPER)
 - Inpatient utilization (SIDR)
 - Demographic information (DEERS)
 - Purchased care (TED-I and TED-NI)

Overview of DaVINCI Data

- DaVINCI also includes information not found in other VA databases such as:
 - Risk factors identified during military service (Health Risk files)
 - Codes for injuries that took place during military service (injury codes)
 - Military characteristics not found in VA, such as rank and locations of service
- The [DaVINCI Data Academy](#) includes resources for understanding and working with DaVINCI data including training webinars, a DaVINCI Data Dictionary, and DoD Dataset Descriptions.

DoD DaVINCI Cost Variables

Inpatient Cost Data

- Inpatient cost data can be found in Src.DaVINCI_SIDR and Src.DaVINCI_TEDI
 - **SIDR file:** Contains data from MTF inpatient care (i.e., direct care)
 - **TED-I file:** Contains data on inpatient hospital care received through Tricare (i.e., purchased care)

SIDR MTF Hospitalization Cost

- The SIDR file contains one record per discharge.
- It does not include a total cost variable, rather there are variables with subtotals for different components of the cost.
- To calculate total costs in the most comparable way to VA, data users can sum the following cost variables

$$FCANCLAB+FCANCRAD+FCCLNSAL+FCICU+FCOTHANC+FCOTHSAL+FCSUPPRT+FCSURG = total\ cost$$

- This sum can be compared to the total cost variable (totcost) in HERC's MCA Discharge File.

SIDR MTF Hospitalization Total Cost

Variable	Description
FCANCLAB	Ancillary laboratory portion of full cost
FCANCRAD	Ancillary radiology portion of full cost
FCCLNSAL	Clinician salary portion of full cost
FCICU	Intensive care unit portion of full cost
FCOTHANC	Other ancillary (non-lab or radiology) portion of full cost
FCOTHSAL	Non-clinician salary portion of full cost
FCSUPPRT	Support portion of full cost
FCSURG	Surgery portion of full cost

SIDR MTF Hospitalization Variable Cost

Variable	Description
Variable_Cost	Total of all components of variable cost
VCANCLAB	Ancillary laboratory portion of variable cost
VCANCRAD	Ancillary radiology portion of variable cost
VCCLNSAL	Clinical salary portion of variable cost
VCICU	Intensive care unit portion of variable cost
VCOTHANC	Other ancillary (non-lab or radiology) portion of variable cost
VCSUPPRT	Support portion of variable cost
VCSURG	Surgery portion of variable cost
VCDIRECT	The direct portion of variable cost, less clinician salary

Variable costs can vary with the volume and intensity of services provided.

Inpatient Tricare Cost Variables (TED-I)

- The TED-I file contains information on the amount paid by Tricare as well as other third-party payers for inpatient hospitalizations.

Variable	Description
TOTAL_AMOUNT_PAID	Amount paid on the inpatient admission claim by Tricare
amtohi	Amount paid by another third-party payer (not Tricare)

Outpatient Cost Data

- Outpatient cost data can be found in Src.DaVINCI_CAPER and Src.DaVINCI_TEDNI.
 - **CAPER** is the primary source for MTF outpatient care (i.e., direct care) data
 - **TED-NI** is the primary source for data on outpatient care received through Tricare (i.e., purchased care).
- CAPER contains a total cost variable for the outpatient encounter (Full Cost). It also contains cost variables for specific components.

Outpatient MFT Care Cost Variables (CAPER)

Variable	Description
FullCost	Total cost of outpatient encounter
FullCostClinSal	Clinician salary portion of total cost
FullCostLab	Laboratory portion of total cost
FullCostPharm	Pharmacy portion of total cost
FullCostRad	Radiology portion of total cost
FullCostOtherAnc	non-laboratory and non-radiology ancillary amount of total cost
FullCostOtherSal	non-clinical salary portion of total cost
FullCostOther	Other (not included in the other categories) portion of total cost

Outpatient MTF Care Cost Variables – Variable Costs (CAPER)

Variable	Description
VarCost	Total variable cost of the outpatient encounter
VarCostClinSal	Clinical salary portion of the variable cost
VarCostLab	Ancillary laboratory portion of the variable cost
VarCostPharm	Pharmacy portion of the variable cost
VarCostRad	Ancillary radiology portion of the variable cost
VarCostOtherAnc	Non-laboratory and non-radiology ancillary portion of the variable cost
VarCostOtherSal	Non-clinical salary portion of the variable cost
VarCostOther	Portion of the variable cost not included in other categories

Variable costs can vary with the volume and intensity of services provided.

Outpatient Tricare Cost Variables in (TED-NI)

- The TED-NI data contains information on the amount paid by Tricare as well as other third-party payers for outpatient encounters.

Variable	Description
TotalAmountPaid	Amount paid for the outpatient encounter by Tricare
amtahiraw	Amount paid for the outpatient encounter by other health insurance

Pharmacy Costs

- Pharmacy cost data is available for outpatient direct care (care at MFTs).
- The variable FullCostPharm in the CAPER file indicates the pharmacy portion of the total cost.
- Pharmacy costs are not separated in the inpatient data.
- Pharmacy costs are also not available for care received through Tricare.

Challenge- Comparing Outpatient DoD and VA MTF Costs

- VA facility encounters include Clinic Stop Codes which indicate the type of clinic in which an individual receives care.
 - VA outpatient costs in administrative Managerial Cost Accounting (MCA) data are based on clinic stop codes.
- Similarly, DoD facility encounters include MEPRS codes which indicate the type of DoD clinic in which an individual receives care.
 - DoD outpatient costs in administrative DoD data are based on MEPRS codes.

Comparing DoD and VA MTF Outpatient Costs

- To compare costs meaningfully between DoD and VA a crosswalk between VA Clinic Stop Codes and DoD MEPRS codes is needed.
- Future Cerner data will include new stop codes. We have not been able to yet ascertain if these will be identical between DoD and VA.

Linking DoD to VA Databases

- DaVINCI data can be linked to OMOP and other VHA administrative data. Although the primary patient identifier in DaVINCI data is EDIPI, which is unique to DaVINCI, the data also contain three linking variables:
 - Person_ID: link to VHA OMOP tables
 - PatientSID: link to CDW data
 - PatientICN: link to CDW data

Variables Available in VA and DoD Inpatient Hospitalization Databases

- Additional key variables in both VA and inpatient DaVINCI databases:
 - diagnosis related group (MSDRG)
 - fiscal month, year and calendar year
 - age and sex
 - length of stay
- DoD contain additional variables not in VA

Access

- Access to DaVINCI data is currently available for approved research and operations projects.
- Staff of approved research projects can request access through the Data Access Request Tracker (DART).
- Visit the [VHA Data Portal](#) to learn more about accessing DaVINCI data.

Access

- Approved operations projects should submit a DaVINCI data request memo to VINCI staff. Additional information is available on the [DaVINCI Data Academy webpage](#).
- DaVINCI data is also available in Observational Medical Outcomes Partnership (OMOP) format.
- Either format can be requested through DART.
- OMOP DaVINCI data does not contain cost at this time.

Example of Comparing DoD and VA Cost of COVID Hospitalizations

What are the costs of COVID-19 hospitalizations in two different health systems?

The Cost of Producing Hospitalization-

- Time horizon

- Fixed

- Patient health status and other characteristics

Understand patient preferences, risk assessment

Procedures

- Medications
- Nursing
- Other Personnel
- Procedures

- More Intensive Care
- Ventilator

Post Discharge

Discharge planning

- Working with the patient for follow-up care

Cost types:

Personnel

Equipment

Overhead

} *These are available as different variables in DoD SIDER and VA HDISCH databases.*

Cost Regression

- Use a regression model to estimate the marginal cost of an activity
- Caveats
 - Only works when there are existing cost data
 - Not a good method for a new technology (e.g., secure messaging) where cost accounting may be underdeveloped

Quality

- In this example, we make an assumption about efficient production
- Quality is also unobserved
- Changing assumptions about costs could affect quality (and outcomes).

Example: Estimating Costs Using Administrative Data in VA and DoD

- This was done in collaboration with Dr. Patrick Richard, Uniformed Services University of the Health Sciences.
- Dr. Richard was crucial in providing the correct summation of DoD SIDER variables to estimate a total cost per hospitalization to approximate the total cost variable in VA HDISCH database.

Operations Data for DoD and VA

- We used operations databases from DaVINCI for inpatient MTF (SIDR).
- We used operations databases from VA containing hospital costs (hdisch20)
- We identified hospitalizations with a primary diagnosis of U071-COVID-19 which was approved for use by CDC in FY2020 DoD and VA databases.
- We tried to match cost between DoD and VA as closely as possible.
- We used totcost from hdisch20 from VINCI.

Operations Data for DOD and VA

- We created a DoD MTF total cost variable for the hospitalization from SIDR, total cost=FCANCLAB+FCANCRAD+FCCLNSAL+FCICU+FCOTHAN C+FCOTHSAL+FCSUPPRT+FCSURG.
- We also obtained common variables for diagnosis related group (MSDRG) fiscal month, age and sex, and length of stay common in both DoD and VA databases.
- We also created a variable for both DoD and VA databases, cost per day per hospitalization =total cost of hospitalization/length of stay of hospitalization.

Analyses in Merged Databases

- After conducting the analyses in the separate DoD and VA databases, we merged the data based on creating the same variable names for the common variables in both databases.
- We then estimated models for total cost, length of stay and cost per day.
- We adjusted for being a DoD hospitalization relative to VA in all models to test for differences in costs and length of stay.

Primary ICD U071 FY2020 MTF and VA Hospitalizations

FY 2020 ICD10 U071- COVID-19 as Primary Diagnosis	DOD N=773	VA N=7,818
Total Cost of the Hospitalization	Mean=\$28,396 Median=\$13,640	Mean=\$61,268 Median=\$31,587
Length of Stay	Mean=6.53 Median=4	Mean=12.99 Median=7
Cost Per Day	Mean=\$4,633 Median=\$4,276	Mean=\$5,155 Median=\$4,474
DRG 177	N=536	N=5,877
Total Cost of the Hospitalization	Mean=\$21,846 Median=\$13,688	Mean=\$61,858 Median=\$32,850
Length of Stay	Mean=5.87 Median=4	Mean=13.36 Median=7
Cost Per Day	Mean=\$4,523 Median=\$4,219	Mean=\$5,150 Median=\$4,523

Combined DOD and VA Total Cost and LOS Models

Total Cost	Total Cohort N=8,951	DRG 177 N=6,143
Age>=50	\$240	\$807*
Female relative to Male	-\$267	\$73
Length of Stay	\$5,078*	\$5,082*
DRG 177 relative to other DRGs	-\$157	N/A
DOD	\$329	\$736*
Length of Stay		
Age>=50	4.53*	4.22*
Female relative to Male	-1.75*	-1.70*
DRG 177 relative to other DRGs	0.80	N/A
DOD	-2.83*	-3.70*
* P<0.05		

Note: Both Models Adjusted for Fiscal Month

Combined DOD and VA Databases GLM Cost Per Day

Cost Per Day	Total Cohort N=8,951	DRG 177 N=6,413
Age>=50	-\$11	\$172
Female relative to Male	-\$10	-\$1
DRG 177 relative to other DRGs	-\$64	N/A
DOD	-\$520*	-\$572*
*P<0.05		
Note: Both Models Adjusted for Fiscal Month		

Challenges for comparing outpatient costs

Considerations and Challenges

- It is possible to have a good comparison between inpatient hospitalization costs between DoD and VA MTFs based on ICD codes or MSDRGs.
- It is possible to sum all outpatient costs to compare between VA and DoD MTFs for a certain cohort.
- It will only be possible to compare outpatient costs for specific clinic types (e.g., primary care, mental health, pulmonary, etc.) when a crosswalk between VA Clinic Stop Codes and DoD MEPRS codes is created.

Resources

- HERC's DaVINCI Cost Data page:
<http://vaww.herc.research.va.gov/include/page.asp?id=davinci>
- Dismuke-Greer CE, Richard P. Understanding the impact of COVID-19 on hospitalization costs in DoD and VA. Technical Report 39. Menlo Park, CA. VA Palo Alto Health Economics Resource Center; March 2022. Available at
<https://www.herc.research.va.gov/include/page.asp?id=technical-report-39-covid19-dod>.
- DaVINCI Data Academy:
https://vincicentral.vinci.med.va.gov/SitePages/VINCI_University-DaVINCI_Academy.aspx
- VINCI Central: <https://vincicentral.vinci.med.va.gov/>
- VHA Data Portal DaVINCI page:
<http://vaww.vhadataportal.med.va.gov/DataSources/DAVINCI.aspx>

Questions?