VIReC Database and Methods Cyber Seminar Series

VIReC
RESEARCHERS' GUIDE TO VA DATA

Measuring Laboratory Use and Results using VA Decision Support System National Extract Data

April 4, 2011

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VA Information Resource Center

Session Outline

- Overview of VA DSS national lab data

- Finding information in VA DSS national lab data

- Measurement of laboratory use and results in VA studies

- Example of VA studies that have used VA DSS national lab data

- Where to go for more help

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Session Outline

- **<u>Overview of VA DSS national lab data</u>**

- **Finding information in VA DSS national lab data**

- **Measurement of laboratory use and results in VA studies**

- **Example of VA studies that have used VA DSS national lab data**

- **Where to go for more help**

Audience Poll

- **Are you currently conducting research that is using DSS LAB and/or LAR National Data Extracts (NDE)?**

    – Yes

    – No

Audience Poll

- **How would you rate your overall knowledge of the DSS LAB and LAR NDEs?**
  - 1 (No knowledge)

  - 2

  - 3

  - 4

  - 5 (Expert-level knowledge)

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DSS Overview

- **What is DSS?**
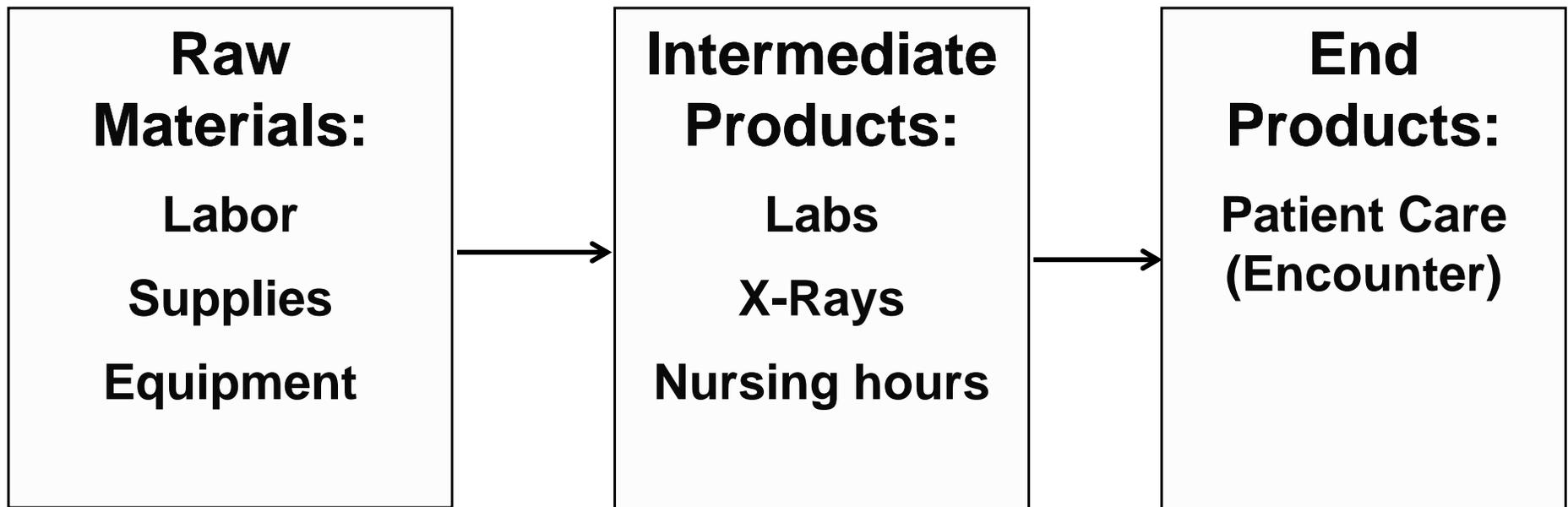 - VA's managerial cost accounting and executive information system

- **What is its primary purpose?**
  - Provide managerially-useful information (e.g., productivity measures, costs per unit of work, quality assessment) to
    - Managers
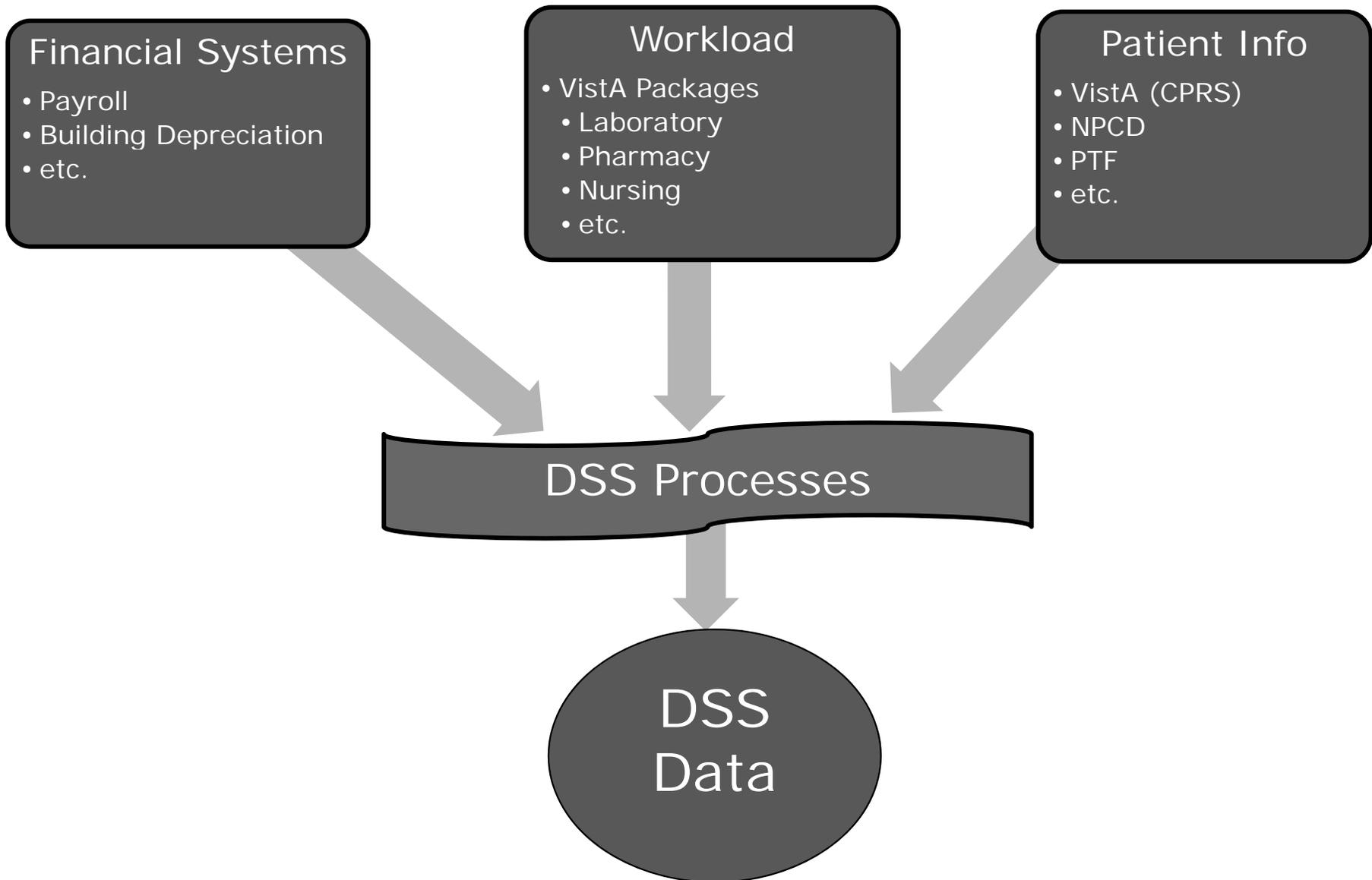   - Undersecretary for Health
    - Secretary
    - Congress

DSS Overview

Health Care Production Process

Raw Materials:		Intermediate Products:		End Products:
Labor		Labs		Patient Care (Encounter)
Supplies	→	X-Rays	→	
Equipment		Nursing hours		

DSS Source Data

Financial Systems
- Payroll
- Building Depreciation
- etc.

Workload
- VistA Packages
  - Laboratory
  - Pharmacy
  - Nursing
  - etc.

Patient Info
- VistA (CPRS)
- NPCD
- PTF
- etc.

DSS Processes

DSS Data

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Where to Find DSS Lab Data

- **VISN Support Services Center (VSSC)**
  - Reports
  - Data Cubes

- **VINCI**

- **Austin Information Technology Center (AITC) Mainframe Computer**
  - National Data Extracts

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Where to Find DSS Lab Data

- **VISN Support Services Center (VSSC)**
  - Reports
  - Data Cubes

- **VINCI**

- **Austin Information Technology Center (AITC) Mainframe Computer**
  - **National Data Extracts**

today's focus

Where to Find DSS Lab Data

- **Austin Information Technology Center (AITC) Mainframe Computer**
  - **National Data Extracts**
    - SAS Files
    - Monthly or quarterly 'updates'
    - Files are cumulative year-to-date

National Data Extracts (NDEs)

<u>Clinical NDEs</u>

- **LAB**
  - Workload and costs
  - Test-level records
- **LAR**
  - Laboratory results for a defined list of tests (currently, 89)
  - Test-level records
- **PHA**
- **RAD**
- **ECS/ECQ**

National Data Extracts

Clinical NDEs

- **LAB**
- **LAR**
- **PHA**
- **RAD**
- **ECS/ECQ**

Other NDE Classifications

- **"Core" Extracts**
  - Inpatient and outpatient encounter-level data
- **Program Activity**
  - e.g., No-Show, RAI
- **Financial**

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LAB & LAR NDE SAS Files

- **Data available from**
  - FY 2002 (LAB)
  - FY 2000 (LAR)

- **NDE File organization**
  - FY 2004 forward
    - 21 different files for each fiscal year, each NDE
    - By VISN (includes inpatient and outpatient data)

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LAB & LAR NDE SAS Files

- ◼ **Data available from**
  - FY 2002 (LAB)
  - FY 2000 (LAR)

- ◼ **NDE File organization**
  - FY 2004 forward
    - 21 different files for each fiscal year, each NDE
    - By VISN (includes inpatient and outpatient data)
  - FY 2000 (LAR) – FY 2003
    - 8 different files for each fiscal year, each NDE
    - Groups of VISNs (4 groups)
    - Inpatient and outpatient data in separate files

LAB & LAR NDE SAS Files
File Naming Convention / Mainframe Location*

RMTPRD.MED.DSS.SAS.FY**xx**.VISN**yy**.**ndename**

For example,

- RMTPRD.MED.DSS.SAS.FY<u>09</u>.VISN0<u>1.LAB</u>
  - Contains FY 2009 inpatient and outpatient data from facilities in VISN 1

* Naming for FY2000 – FY2003 reflects different file organization – see VIReC website.

LAB & LAR NDE SAS Files
File Naming Convention / Mainframe Location*

RMTPRD.MED.DSS.SAS.FYxx.VISNyy.ndename

For example,

- RMTPRD.MED.DSS.SAS.FY09.VISN01.LAB
  - Contains FY 2009 inpatient and outpatient data from facilities in VISN 1

- RMTPRD.MED.DSS.SAS.FY05.VISN12.LAR
  - Contains FY 2005 inpatient and outpatient data from facilities in VISN 12

* Naming for FY2000 – FY2003 reflects different file organization – see VIReC website.

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What information can I find in the LAB and LAR NDEs?

LAB

- Tests performed
  - One record for each completed billable test
  - Includes those performed at point-of-care and some research records
  - Identifies where and when performed

- Costs and other information pertinent to accounting

- Patient information

LAR

- Test results
  - Patient-specific results for 76 tests
  - For those 76, all records entered into VistA (i.e., all in LAB)

- Patient information

What information can I find in the LAB and LAR NDEs?

LAB

- Tests performed
  - One record for each completed billable test
  - Includes those performed at point-of-care and some research records
  - Where and when performed

- Costs and other information pertinent to accounting

- Patient information

LAR

- Test results
  - Patient-specific results for 89 tests
  - Extraction process selects records for those tests only, from VistA Laboratory package

- Patient information

NOT in the
LAB and LAR NDEs

- Diagnoses, procedures, and other clinical information

- Gender, race/ethnicity

- Tests that are not patient-specific
  - e.g., tests done as lab controls or other standardization procedures

- Research records, unless considered VA patient and an encounter is generated in VistA PCE file

Selected Key Variables

LAB	LAR
Test identifier	Test identifier
Where performed	Result
Referral flag	Units reported
Clinic Stop Code	Dates
Dates	

Test Identifiers:
How do I find records containing the test I'm interested in?

LAB NDE

- **VA_LMIP:** Laboratory Management Index Program

  - National list (aka NLT code)

  - Entered by lab staff

  - Assigned locally

  - Not standardized

- **FEED_KEY**

  - 5-digit character variable

  - Usually an LMIP code

Test Identifiers

LAB NDE

- **IPNUM:** Intermediate Product Number
  - Assigned by DSS based on LMIP
  - One IPNUM may be assigned to >1 LMIP

- **TESTNAME**
  - DSS-derived IP description
  - Free-form text field
  - File maintained by individual site teams
  - Name assigned to same test can vary across stations

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Test Identifiers

LAB NDE

- VA_LMIP

- FEED_KEY

- **IPNUM**

Best

- TESTNAME
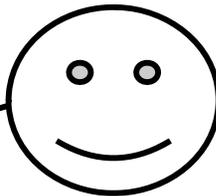
Test Identifiers

LAR NDE

- **DSSLARNO –** Result ID

    - Assigned by DSS, 1 – 89

    - List of available tests on VIReC and DSS websites (at end)

- **Logical Observation Identifier Names and Codes (LOINC)**

LOINC Codes
http://www.loinc.org

- Logical Observation Identifier Names and Codes (LOINC) - universal identifier

- Highly specific - Identifies test, method of analysis, specimen source

- Lab results records pulled based on LOINC

- Implemented nationwide for FY 2009

- Should result in better match between LAB and LAR records than previous method (based on test names)

- Currently, VistA LOINC file contains older version of LOINC code set

FY11 LAR TESTS (abridged)

LAR Test #	DSS Test Name	Reporting Units	LOINC Code
0001	Hemoglobin	G/DL	718-7
0002	Potassium (Serum)	MEQ/L or MMOL/L	2823-3
0003	Sodium (Serum)	MEQ/L or MMOL/L	2951-2, 2947-0
0004	Lithium (Serum)	MMOL/L	14334-7
0005	BUN (Blood Urea Nitrogen)	MG/DL	3094-0
0006	WBC (Total WBC Count)	K/UL or K/MM3	26464-8, 6690-2, 804-5
0007	Digoxin	NG/ML	10535-3
0008	Theophylline	UG/ML	4049-3
0009	AST (Aspartate Transferase)	U/L	1920-8, 30239-8
0010	Glucose (Serum)	MG/DL	2345-7, 1558-6
0011	Creatinine Clearance	ML/MIN	2164-2
0013	GGTP (Gamma GT)	IU/L	2324-2
0014	Dilantin (Phenytoin)	MCG/ML	3968-5
0015	Valproic Acid	MCG/ML	4086-5
0016	Carbamazepine (Tegretol)	MCG/ML	3432-2
0017	Hemoglobin A1C (Glycohemoglobin)	%	17855-8, 17856-6, 4548-4, 4549-2
0018	Alpha 1 Antitrypsin	MG/DL	1825-9
0019	PSA (Prostatic Specific AG)	NG/ML	2857-1
0020	CD-4 (Absolute T Cell Count)	CELLS/CMM, CELLS/MM3, CELLS/UL	8127-3, 24467-3
0021	Prothrombin Time	SEC	5902-2, 5964-2
0022	Total Thyroxine (T-4)	MCG/DL	3026-2
0023	Total Triiodothyronine (T-3)	NG/DL	3053-6
0024	Thyroid Stimulating Hormone (TSH)	MCU/ML	11579-0, 11580-8 3016-3
0025	Folic Acid/Folate	NG/ML	2284-8
0026	Vitamin B12 Level	PG/ML	2132-9
…	…	…	…
0087	Hepatitis B Virus DNA	NEG-POS or NON-REACTIVE-REACTIVE	5007-0, 13126-8, 16934-2, 29610-3
0088	Hepatitis C Genotype	text	32286-7, 48574-8
0089	Hepatitis C (RIBA)	NEG-POS or NON-REACTIVE-REACTIVE	24011-9, 33462-3, 34162-8, 5199-5
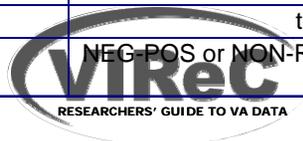
How do I find test results?

- **RESULT –** Test Result
  - Result of the test identified by DSSLARNO
  - Valid values -10000 to 10000
  - Up to 4 decimal digits
  - Some results are text/non-numeric

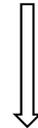- **TESTUNIT –** Units in which the test is reported

DSSLARNO $\Longrightarrow$ **RESULT + TESTUNIT = Test Result**

Example: Total Thyroxine (T-4)

- **DSSLARNO = 0022**

- **RESULT = 4.2**

- **TESTUNIT = mcg/dl**

DSSLARNO 0022

⇓

4.2 + mcg/dl= Thyroxine 4.2 mcg/dl

What about Non-numeric Results?

For example: HIV Antibody

Translation Value	Test Result
0	Negative, Non-Reactive
1	Positive, Reactive
2	Borderline, Indeterminate
3	Test not performed, Quantity not sufficient or other reason
5	Result cannot be translated

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Should I find a one-to-one correspondence between LAB and LAR records?

- **Not for**
  - Tests whose values are calculated from other test values (e.g., creatinine clearance)
    - Only the tests from which the calculated values are derived (i.e., serum creatinine) are costed and have an associated record in the LAB NDE.

  - "Send outs": Two records generated
    1. In-house labor cost of specimen collection, preparation and shipping
    2. Cost of performing the test (or cost charged by non-VA source)

    REF_FLG = "Y", if sent to another VA source

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Case Scenario #1

Diabetes Quality of Care: Hgb A1c Frequency

Question:

We're conducting a retrospective cohort study of care quality among patients with Diabetes. We'd like to measure frequency of Hemoglobin A1c testing among our cohort in FY 2010. Should we use the LAR file to obtain this information?

Case Scenario #1

Diabetes Quality of Care: Hgb A1c Frequency

Question:

We're conducting a retrospective cohort study of patients with Diabetes care quality. We'd like to measure frequency of Hemoglobin A1c testing among our cohort in FY 2008. Should we use the LAR file to obtain this information?

Answer:

No!

LAB NDE is the best source of information for "fact of lab".

Case Scenario #1

Diabetes Quality of Care: Hgb A1c Frequency

Goal:

Measure frequency of Hemoglobin A1c testing among our cohort in FY 2010.

Procedure:

Use the **LAB file**.

1. Obtain feeder key(s) or IPNUM for Hgb A1c test:
   - DSS Intermediate Products table (URL at end)
   - Search on name ("Description" field) *and all variants*.

     e.g., Glycohemoglobin, Glycosylated Hemoglobin, Glycated Hemoglobin, Hb A1c
   - Can double check by searching on IP numbers already found.

Case Scenario #1

Diabetes Quality of Care: Hgb A1c Frequency

DSS Intermediate Product Table

FdrSys	IP Num	FdrKey	CPT/HCPC/ LMIP/ECS Natl Code	Description
ASC	22273	83036	CPT	GLYCOSYLATED HEMOGLOBIN T
ASC	77318	83037	CPT	GLYCOSYLATED HB, HOME DEV
LAB	1148	85027	LMIP	Glycosylated HGB, total
LAB	1149	85051	LMIP	Glycohemogl...t Fraction
LAB	1150	85052	LMIP	GLYCOHEMOGLOBIN A(1) C
LAB	68820	82890	LMIP	GLYCOHEMOGLOBIN A1C POC
LAB	81947	82117	LMIP	GLYCOHEMOGLOBIN HBA 1C CA
LAB	91238	85053	LMIP	GLYCOHEMOGLOBIN HBA 1C

Case Scenario #1

Diabetes Quality of Care: Hgb A1c Frequency

Procedure (cont'd):

1. Obtain feeder key(s) or IPNUM for Hgb A1c test:

2. In **LAB** NDE: Identify study patients' records using SCRSSN, and

3. Keep only FY 2010 records:
    - Several date variables
    - SVC_DTE (service date)
    - YYYYMMDD
    - Default = Year and month that VistA extract was performed, concatenated with '01' for day

Case Scenario #1
Diabetes Quality of Care: Hgb A1c Frequency

Procedure (cont'd):

1. Obtain feeder key(s) or IPNUM for Hgb A1c test:

2. In LAB NDE: Identify study patients' records using SCRSSN

3. Keep only FY 2010 records

4. Pull records with Feed_Key = values identified in Step 1.

Case Scenario #1
Diabetes Quality of Care: Hgb A1c Frequency

Procedure (cont'd):

1. Obtain feeder key(s) or IPNUM for Hgb A1c test:
2. In LAB NDE: Identify study patients' records using SCRSSN
3. Keep only FY 2010 records
4. Pull records with IPNUMs identified in Step 1.

5. Wait! Eliminate 'duplicates' resulting from send-out or referral labs.
    - Drop if REF_FLG (referral flag) = 'Y'

Yield: All study cohort records for Hemoglobin A1c tests performed in FY 2010

Case Scenario #2

Question (from the historical files):

"We're planning a study of the effectiveness of church attendance in preventing chronic kidney disease among patients with hypertension and diabetes. We will recruit 2500 participants receiving care in 10 facilities across 3 VISNs. One of our outcome measures is change in serum creatinine over the study period, June, 2008 to September, 2010. Can we use the DSS LAR NDE for this? What other advice can you give us?"

Case Scenario #2

Preventing Kidney Disease: Change in Serum Creatinine

Goal:

Measure change in serum creatinine between June, 2008 and September, 2010.

Measurement Issues:

1. Switch in method used by DSS to extract results from VistA, implemented October 1, 2008

2. Specimen source not indicated

Case Scenario #2

Preventing Kidney Disease: Change in Serum Creatinine

Measurement Issues:

1. Switch in method used by DSS to extract results from VistA, implemented October 1, 2008

   - Pre- FY09: VistA record extract using test name (remember the test-name linking issue?)

   - FY09 forward, LOINC codes

   - What challenges does this present?

     - Discontinuity in 'measurement' of the outcome presents potential threat to validity in this longitudinal study

     - Little is known yet about LOINC code implementation and resulting data quality

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Case Scenario #2

Preventing Kidney Disease: Change in Serum Creatinine

Measurement Issues:

1. Switch in method used by DSS to extract results from VistA, implemented October 1, 2008

2. Specimen source not indicated

    *   TESTNAME = "Serum Creatinine" but some result values out-of-range and suggest urine, rather than serum creatinines

    *   No DSS field indicating source of lab specimen

    *   Solution going forward: LOINC!

        *   LOINC codes are specific to the specimen source

        *   When it says "*Serum* Creatinine", it really will be.

Measurement Issues
Take Home Messages

- **DSS Lab Data: Fabulous resource, complex database**
- **Careful examination is warranted**
- **Clinical advice is critical**

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- <u>Example of VA studies using VA DSS national lab data</u>

- Where to go for more help

How has outpatient healthcare utilization been measured in VA studies?

Laxmisan, et al., 2011

Repeated Hemoglobin A1C Ordering in the VA Health System

American Journal of Medicine

How have laboratory use and results been measured in VA studies?:
Laxmisan, et al., 2011

- Retrospective cohort study of patients newly diagnosed with diabetes in FY2006 (n=1,038,492)

- Evaluation of healthcare quality/efficiency: appropriateness/timing of Hemoglobin A1C testing

- Identified cohort using outpatient encounter data

- DSS LAR NDE

- Outcome measures:

  - Proportion of patients receiving repeat HbA1c testing within 30 and 90 days

  - Distribution and frequency of repeated HbA1c tests in 365 days

How have laboratory use and results been measured in VA studies?:
Laxmisan, et al., 2011

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  - Distribution and frequency of repeated HbA1c tests in 365 days

How have laboratory use and results been measured in VA studies?: Laxmisan, et al., 2011

- ## Measurement issues
  - Presence of lab result used as proxy for lab ordered
    - 17% had no HbA1c test
    - Consider using LAB NDE to verify
    - Accounting for non-VA labs

How have laboratory use and results been measured in VA studies?:
Laxmisan, et al., 2011

- Measurement issues
  - Out-of-range values
    - 0.1% >50%
  - Time-to-repeat testing
    - Order date (ORD_DATE)
    - Result date (RES_DATE)
    - Test date (SVC_DTE)

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Data Access
DSS National Data Extracts

Access Information:
See VIReC website

http://vaww.virec.research.va.gov/Suppor t/Training- NewUsersToolkit/DataAccess.htm

VIReC Website

– http://www.virec.research.va.gov
http://vaww.virec.research.va.gov

– Information on VA data sources and how to access data

– DSS NDEs
  - Research User Guide (RUG)
  - Select variable frequencies
  - Select person-level frequencies
  - Periodic updates and data quality information

VIReC Help

- **HSRData Listserv**
  - Join at the VIReC website
  - Discussion among >400 data stewards, managers, and users
  - Past messages in archive (on intranet)

- **VIReC Help Desk**
  - VIReC staff will answer your question and/or direct you to available resources on topics
  - VIReC@va.gov
  - (708) 202-2413

Decision Support Office Website

Intranet only

http://vaww.dss.med.va.gov/index.asp

–Multiple resources

–Left navigation panel:

• National Reporting

• Program Documents

Selected Recent References on
VA DSS National Laboratory Data

- Please view the attachment located in the handout section of the Live Meeting presentation

Questions?

Upcoming Seminars

- **May 2, 2011**

  "Improving Mortality Ascertainment Using the VA Vital Status Dataset"

  Noreen Arnold

- **June 6, 2011**

  "Overview of VA Data, Information Systems, National Databases and Research Uses"

  Denise Hynes, PhD, MPH, RN