

Estimation of Adherence to Antipsychotic and Diabetic Medications in a Sample of Schizophrenia Patients

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Overview and Scope of the Presentation

- ▶ Discussion will focus on the use of SAS® and specific techniques.
- ▶ Medication Possession Ratio (MPR) is the measure used for adherence
- ▶ Limited discussion of literature, research background and statistical methodology



SAS Specific Focus on

- ▶ HASH: Data Step Object
- ▶ Narrow versus Wide Data Sets
- ▶ ARRAYS to calculate Medication Possession Ratio
- ▶ Special DO Loops to process Narrow Data Sets with ARRAYS.



Research Background and Study Objectives

- ▶ Adherence literature – plenty
- ▶ Adherence in the case of co-morbidity – limited
- ▶ Study Objective: Examine Schizophrenia patients in relation to adherence to antipsychotics (ONLY) and compare with adherence to antipsychotics and Diabetic Medications.



Brief Results

- ▶ Co-morbid subjects more adherent than those ONLY on Antipsychotics but not statistically significant
- ▶ Direction of the relationship confirms findings from a recent study done on a different population (VA).



Sample Selection

- ▶ Schizophrenia cases: patients with at least one inpatient or outpatient medical claim with a diagnosis of schizophrenia (ICD-9 codes 295.xx) and at least one prescription for an antipsychotic medication in 2006.
- ▶ Cases were further restricted to those individuals participating in health plans that reported prescription drug data for both 2006 and 2007.
- ▶ Subset who were on Diabetic medication (had at least one prescription for a diabetes medication in 2006)

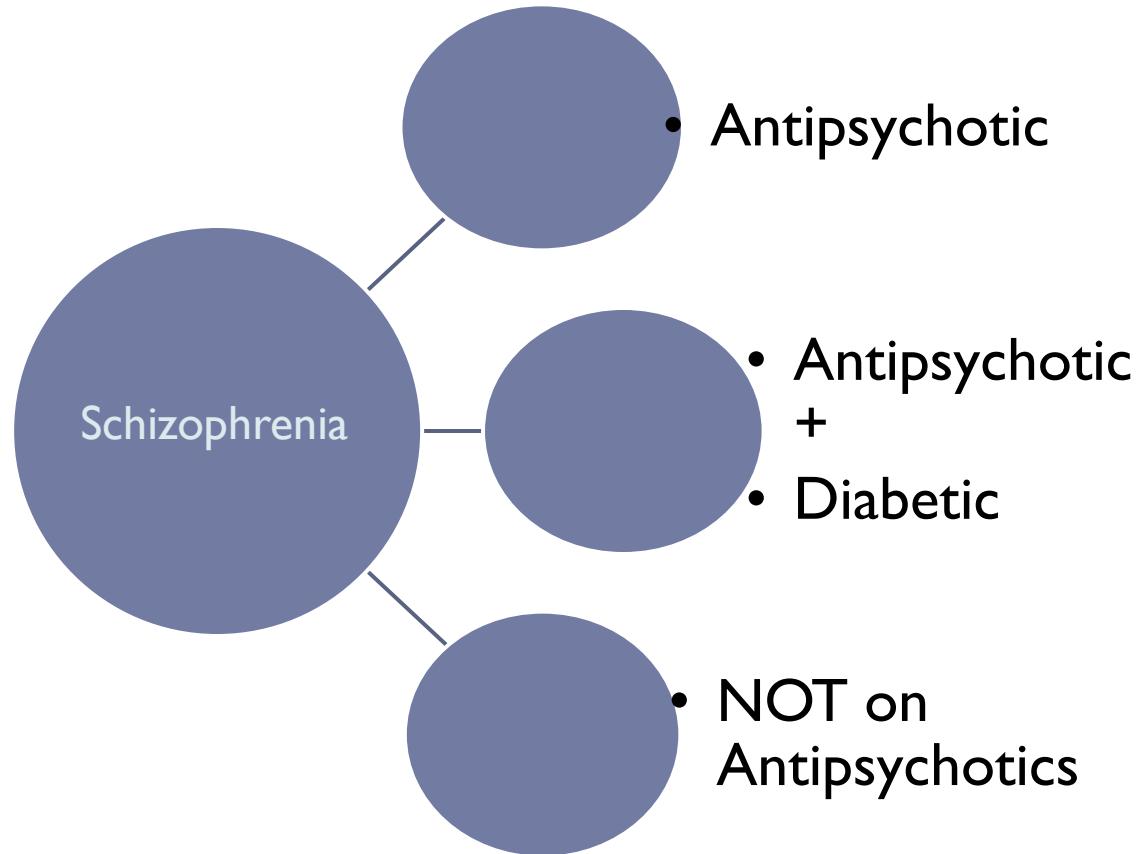


Sample Selection (Contd.)

- ▶ Independent Subset who were NOT on Diabetic medication (mutually exclusive to the above)
- ▶ Subset Diabetic patients to those who also took Antipsychotic medication.
- ▶ Subset NON-Diabetic patients to those who took Antipsychotic medication and no other chronic medication.



Sample Selection



Schizophrenics on Diabetic Meds

- ▶ Subset based on Therapeutic Class of Medication Filled (172, 173 and 174)
- ▶ AntiPsychotic + Diabetic Meds
- ▶ Excluded – small number of subjects NOT taking Antipsychotics and also those Diabetics on Insulin



Comparator Population

- ▶ Subset of Patients taking **ONLY** antipsychotic medication.
- ▶ Excludes any non-Antipsychotic **MORE** than $\frac{1}{4}$ of the number of Days Supply of Antipsychotics



Code for Efficient selection

- ▶ Create a dataset of patients
- ▶ Use the Data Step Object: HASH
- ▶ Technique that loads a whole table to memory.
- ▶ Efficient to subset a Large dataset such as Market Scan Data.



Data Step Object: HASH

- ▶ Load the dataset of SUBSET patients to memory
- ▶ `declare HASH ht (dataset: "diabidlist");`



Data Step Object: Hash

- ▶ Declare ENROLID as the KEY to be loaded to memory.
- ▶ No additional DATA required.

- ▶ **ht.defineKey** ("enrolid");

- ▶ **ht.defineDone** ();



Data Step Object: Hash

- ▶ Extract from Large dataset the records with the same KEY as in **diabidlist**
- ▶ `set <schizophrenia data> ;`
- ▶ `if ht.find() = 0 ;`
- ▶ NOTE: DATA statement used :
- ▶ **real time** **0.63 seconds**
- ▶ **cpu time** **0.64 seconds**



Data Step Object: Hash

- ▶ Selected mutually exclusive groups
- ▶ ANTIPSYCHOTIC and DIABETIC medications
- ▶ ONLY ANTIPSYCHOTIC medication.



Data Structure – Wide v/s Narrow

ID	Fill Date 1	Fill Date 2	Fill Date N	Days Sup 1	Days Sup 2	Days Sup N
1001	1/1/2006	1/31/2006	12/30/2006	30	30	30

ID	Fill Date	Days Supp
1001	1/1/2006	30
1001	1/31/2006	30
1001	12/30/2006	30



Wide v/s Narrow – Multiple Drugs

ID	Fill Date 1 Drug A	Fill Date 2 Drug A	Fill Date N Drug A	Fill Date 1 Drug B	Fill Date 2 Drug B	Fill Date N Drug B
1001	1/1/2006	1/31/2006	12/30/2006	1/1/2006	1/31/2006	12/30/2006

ID	Drug Name	Fill Date	Days Supp
1001	Drug A	1/1/2006	30
1001	Drug A	1/31/2006	30
1001	Drug A	12/30/2006	30
1001	Drug B	1/1/2006	30
1001	Drug B	1/31/2006	30
1001	Drug B	12/30/2006	30



Why Wide versus Narrow?

- ▶ Principles of Data Bases rely on multiple NARROW data sets that can be linked together easily on a few common keys (Normalized Data)
- ▶ Wide Data – Useful for Hard Copies when Width is Manageable (De-normalized Data).
- ▶ Narrow dataset is Easier on the Eyes for On Screen Viewing and Filtering.



Working with Narrow Data Structure

- ▶ SAS Primarily Row Based but Flexible – Powerful Tools at your Disposal
- ▶ Temporary ARRAYS that disappear after the step
- ▶ Special DO LOOP that works with ROWS to fill ARRAY elements
- ▶ Collapses to one record per patient with - **minimal column additions.**



Special DO Loop and Temporary Array Manipulations

- ▶ `array lup (300) _temporary_ ;`
- ▶ `do until (last.enrolid) ;`
- ▶ `set restpsych ;`
- ▶ `by enrolid thercls ;`
- ▶ `lup(thercls) = sumdaysupp ;`
- ▶ `end ;`



Special DO loop - Narrow Data Set

ID	Lup(1)	Lup(2)	Lup(3)
1001	295	.	.

ID	Thera peutic Class	Sum of Days Supplied
1001	1	295
1001	2	304
1001	3	275

```
do until (last.enrolid) ;  
  set restpsych ;  
  by enrolid thercls ;  
  lup(thercls) = sumdaysupp ;  
end ;
```



Special DO loop - Narrow Data Set

ID	Lup(1)	Lup(2)	Lup(3)
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Special DO loop - Narrow Data Set

ID	Lup(1)	Lup(2)	Lup(3)
1001	295	304	275

ID	Thera peutic Class	Sum of Days Supplied
1001	1	295
1001	2	304
1003	3	275

```
do until (last.enrolid) ;  
  set restpsych ;  
  by enrolid thercls ;  
  lup(thercls) = sumdaysupp ;  
end ;
```



Demo through Data Step Debugger

- ▶ Example – Data Step Debugger
- ▶ Special DO loop – Allows Powerful Manipulation
- ▶ Demonstrate How it Does
- ▶ Run Example



Special DO loop and Temporary Array Manipulations

```
▶ do until (last.name) ;
▶   set _temp5_3 ;
▶   by enrolid name svcdate;
▶   if stopProcessDate then continue ;
▶   if first.name then
▶     do ;
▶       firstSupplyDate = svcdate ;
▶       AnniversaryDate =
▶         ( firstSupplyDate + 365 ) - 1 ;
▶     end ;
```



Special DO loop Manipulations

```
▶ if svcdate >= AnniversaryDate
▶   then stopProcessDate = svcdate ;
▶
▶   if not first.name and
▶     not (first.name and last.name)
▶     and (svcdate - PrevServiceDate
▶       > (.5*PrevSupply))
▶   then cumdays=sum(cumdays, daysupp) ;
```



Minimal Column Additions

- ▶ `array allrx (*) &_druglist ;`
- ▶ `array psych (*) &_druglist2 ;`

- ▶ `allrx(input(name, _indrg.)) =`
- ▶ `cumdays / 365 ;`



MPR Calculations and Explicit OUTPUT Statement

▶ `if last.enrolid then`

▶ `do ;`

```
▶ psychMPR = (sum(of psych(*))) /  
▶     (  
▶         (dim(psych) -  
▶             nmiss(of psych(*))  
▶         )  
▶     ) * 365  
▶     ) ;
```

▶ `output ;`

▶

Ready for Analysis

- ▶ All this - just to get the data ready? YES!!!
- ▶ Data structure – relatively unchanged
- ▶ Statistical Models – Ready to run



Statistical Model

- ▶ Westfall's recommendation of MULTITEST was used to guard against false significance.
- ▶ Cochran-Armitage Linear Trend and Linear Contrasts were used.
- ▶ Results confirmed Relationship found in recent study
- ▶ However, fell short of Statistical Significance.



Conclusion

- ▶ Hash Object – for efficient selection of subsets from Large data sets.
- ▶ Metrics are found in many published papers – demonstrating superiority over regular subset.
- ▶ Special DO loop to work with a Narrow data structure.
- ▶ Use of temporary arrays to calculate MPR.



Contact Information

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