REPRESENTING PATIENT MEDICATION HISTORY WITH SYMBOLS

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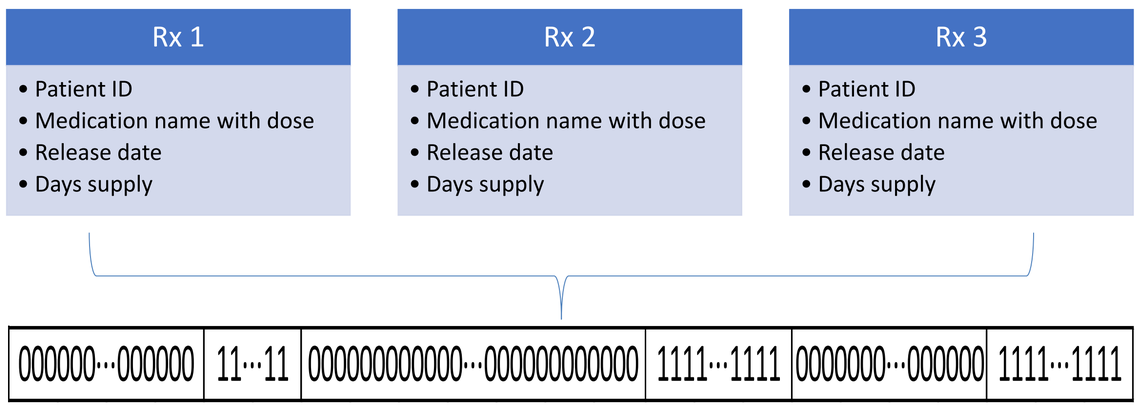
INTRODUCTION

From Individual Prescription Records to Medication Use History

- Patterns of medication use are an essential part of patient care and research.
- It is time consuming to process large amounts of individual prescription records to define and search for a specific pattern.
- Researchers interested in different medication use patterns often perform similar tedious data cleaning and preparation steps separately.
- We introduce a method using an **intermediate data object**, in the form of binary text string.
- This string can be mined and used by multiple researchers to create the most suitable medication-use-pattern analysis variable for their projects.



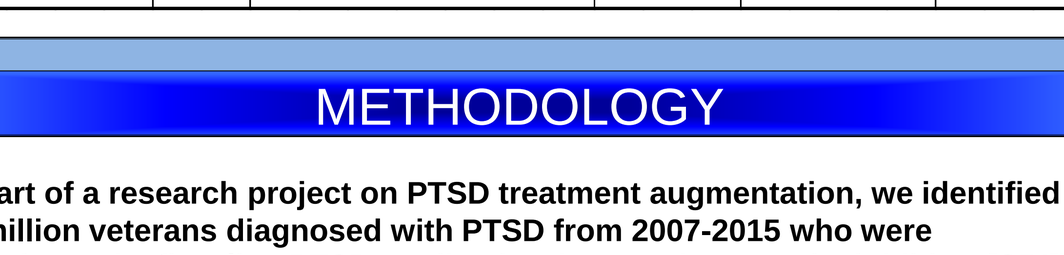
METHODOLOGY

As part of a research project on PTSD treatment augmentation, we identified 1.1 million veterans diagnosed with PTSD from 2007-2015 who were administered a first-line PTSD medication (serotonin reuptake inhibitor [SRI]), and one of the four classes of augmentation medications: Antipsychotics (AAP), Tricyclic antidepressants (TRI), Mirtazapine (MIR), and Prazosin (PRA).

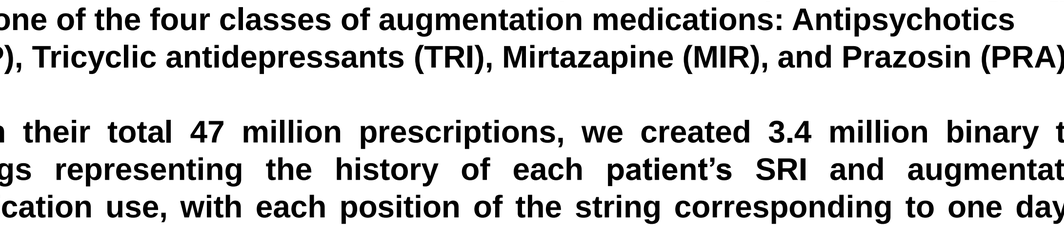
From their total 47 million prescriptions, we created 3.4 million binary text strings representing the history of each patient's SRI and augmentation medication use, with each position of the string corresponding to one day of the 9-year study period. The binary digit indicates whether the patient was on the medication that day (1=YES, 0=NO).

We searched the strings to find patients whose medication history satisfied the following selection criteria:

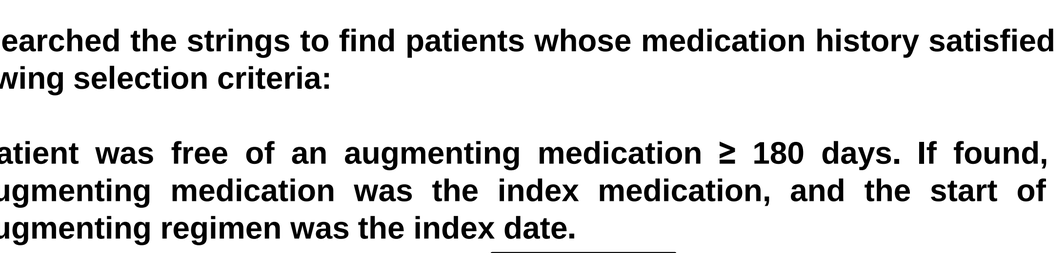
1. **Patient was free of an augmenting medication ≥ 180 days. If found, the augmenting medication was the index medication, and the start of the augmenting regimen was the index date.**



2. **Patient was on the index medication ≥ 60 days in a 120-day period within 1 year after the index date.**



3. **Patient was on SRI ≥ 30 and 60 days within 1 year, before and after the index date, respectively.**



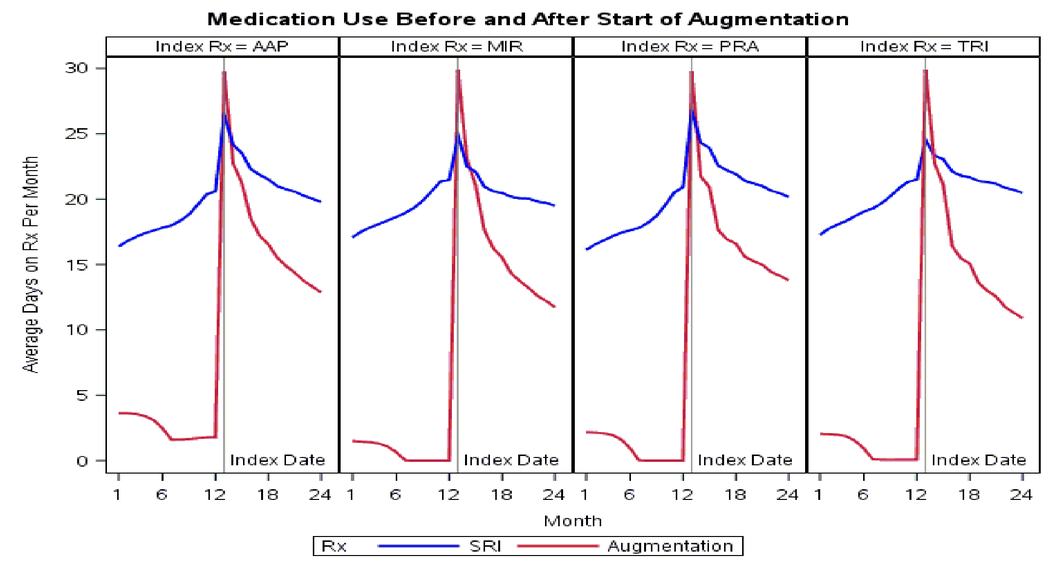
RESULTS

Ability of Strings to Preserve Key Information with Less Computing Space:

- 3.4GB prescription data were distilled and reduced to text strings at 1/7 of the original size (441MG), while preserving central information regarding medication usage.

Use of Strings for Data Cleaning and Analysis:

- Using strings, we were able to successfully select patients based on inclusion/exclusion criteria. The figure below shows, as expected, that few patients used augmenting medications during the pre-augmentation year.
- Given our requirement of a wash-out period, as expected, we see a sharp peak in prescriptions at the initiation of augmentation. When we examined PTSD symptom scores over the same time period, we found they gradually increased and peaked around the time augmenting medications were started.
- During the post-augmentation year, both SRI and augmenting medication use decreased, with augmenting medication use declining at a faster rate and SRI returning to pre-augmentation level.



CONCLUSIONS

- 47 million prescriptions from 1.1 million veterans were condensed into 4.3 million text strings, representing their medication use history between 2007 and 2015.
- Common text manipulation and matching functions were used to select patients whose medication use patterns satisfied 3 selection criteria for a comparative-effectiveness study between 4 classes of PTSD augmentation medications.
- Days on medication are easily calculated from the medication strings, revealing trends in usage over the 2-year comparison period.

Future Plans

- Multiple strings can be combined to represent dependent relationships such as overlapping use of medications.
- Time-varying covariates in terms of medication use can be easily generated for measurements taken at any time.
- Text symbols are not limited to binary. Choices depend on the applications and use cases.
- Strings can be further compacted for storage and reconstituted when needed. For example, storing the length instead of the expanded same-character substring.

Acknowledgements

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