Instance-based optimization of order groups following electronic health record (EHR) implementation

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Introduction

Order sets are a collection of orders aggregated in a single location for a specific condition, process, or clinical situation used during computerized provider order entry (CPOE).

Order sets have shown to improve ordering efficiency and increase adherence to evidence-based medicine, thereby decreasing variation in care.

Order sets require regular maintenance due to changes in evidence, changes in supply, or updates to internal processes.

Optimizing order sets through standardization and modularization should decrease the significant resource burden required to review and maintain these order sets.

The objective of this project is to identify similar perioperative order groups based on the overlap of their medication orders, focusing on order groups containing cefazolin, clindamycin, and vancomycin.

Methods

- Calculate the similarity between perioperative order group using the equivalence score (ES),
- ES is a modified Jaccard coefficient, measures the percent overlap between two order groups and account for small sample sizes

$$ES(S,T) = JCmod(S,T) = \frac{\sqrt{st \times (st - 0.8)}}{s + t + st}$$

s: unique source members

t: unique target members

st: overlap

- ES ranges from 0 to close to 1, with 0 implicating no overlap, and higher scores representing an increased degree of overlap
- ES >= 0.8 as significant relationship for manual review
- Manual review will be performed to determine if the order groups are truly duplicates or candidates for standardization, accounting for additional variables such as frequency, dose, route, and specimen type

Example

Lexical matching

Order Group 1

POST-OP ADMISSION BOWEL REGIMEN

Order Group 2

POST-OP ADMISSION PRN BOWEL REGIMEN

Explanation

1. Group 1 and 2 are lexically similar. The groups differ by a single word
2. The lexical similarity, would infer that the groups have similar members
3. Order Group 1 and 2 contain 5 and 3 orders respectively.
4. However, the two order groups are not similar.
5. See explanation below

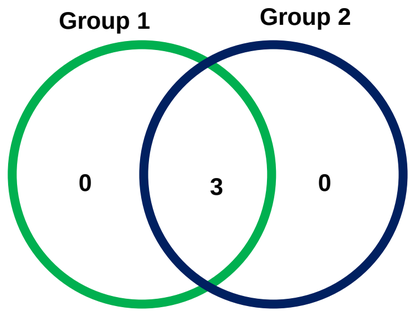
Instance-based matching

Order Group 1

POST-OP ADMISSION PRN BOWEL REGIMEN

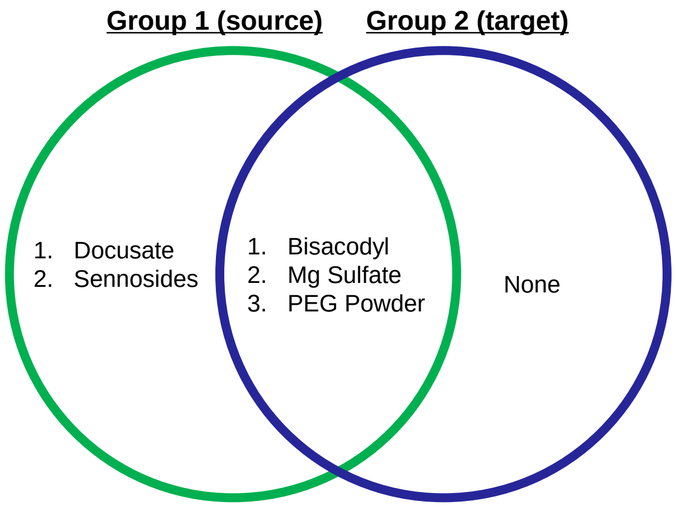
Order Group 2

NON-SURGICAL ADMISSION ORDERS PRN BOWEL REGIMEN



ES = 0.86

Instance-based Matching



Order Group 1: POST-OP ADMISSION BOWEL REGIMEN
Order Group 2: POST-OP ADMISSION PRN BOWEL REGIMEN

Explanation

1. Docusate, sennosides, and sennosides-docusate are unique to Order Group 1.
2. Bisacodyl, Mg sulfate, and PEG powder are in Order Group 1 and Order Group 2.
3. Order Group 2 does not have any unique members
4. ES Calculation:

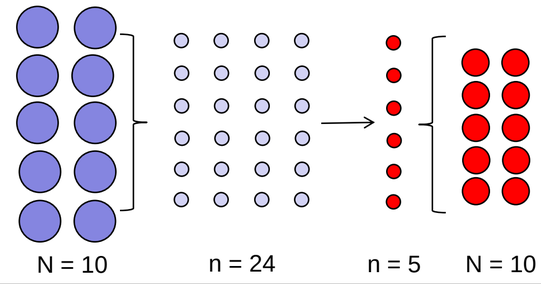
$$ES(S,T) = JCmod(S,T) = \frac{\sqrt{3 \times (3 - 0.8)}}{2 + 0 + 3}$$

$$ES(S,T) = JCmod(S,T) = 0.51$$

5. Relationship between Order Group 1 and Order Group 2 does not meet the criteria for manual review

Proof-of-Concept

- Instance-based matching approach was applied to inpatient anticipatory PRN order groups (including: bowel, pain, nausea, and sleep)
- Based on this analysis, we created 5 standard order groups and retired and replaced 24 duplicate order groups affecting 10 order sets.



Next Steps

Next 6 months:

- Our goal is to identify opportunities for order group standardization through automated instance-based matching techniques.
  - Focus on order groups containing medication orders for cefazolin, clindamycin, and vancomycin.
  - Complete a sensitivity analysis by incorporating frequency, dose, route, and specimen type

Future Plans:

- Expand scope of order groups
- Establish standard for order group and order set optimization

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